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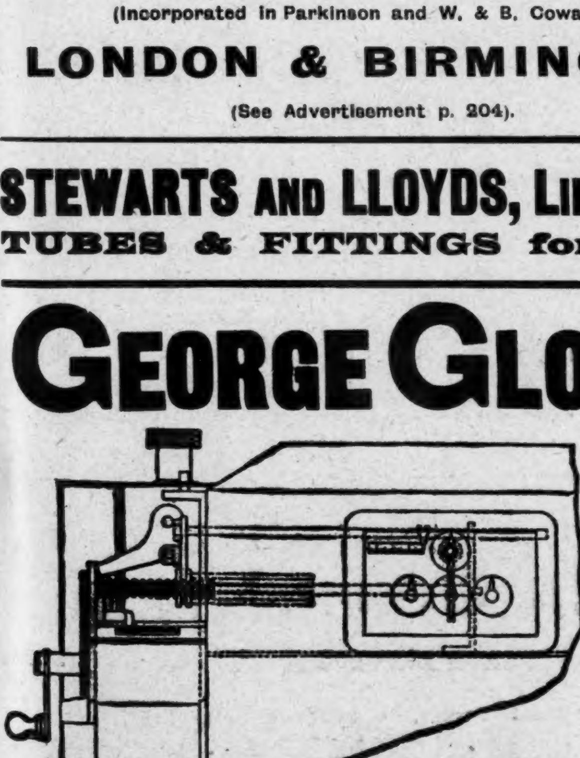

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VOL. CXL., No. 2842.] TUESDAY, OCTOBER 30, 1917. [69TH YEAR.

EDITORIAL NOTES.

The Industry's Appeal to the President of the Board of Trade.

THERE is considerably more hopefulness to-day than there has hitherto been that the gas industry will early be granted some measure of relief from the extraordinary financial hardships and their results that have come upon it largely through its peculiarly circumscribed legislation being unequal to the combined inflictions of the war. That hope has previously been heavily clouded has not been due to any feeling that the claim of the industry was not founded on justice, but owing to the irresponsiveness of authority to the knockings at its door. Last week there was a distinct change. Sir Albert Stanley, the President of the Board of Trade, who knows from personal experience of the administrative difficulties besetting legislatively curbed enterprises in these times, listened patiently and sympathetically to the narration of the weighty concatenated troubles of the industry, and the iniquitous issue in depreciated return upon capital, and the natural outcome of that condition —the fall of stock values, which can only be reparable by the adjustment of the return upon an equitable basis. These results, which alone the President must have seen are unmerited in the circumstances of the manifold services the gas industry is rendering to the nation, are not final if allowed to continue, and to grow worse. They have a bearing on the future—upon the prospective service to the community and the country generally, and upon the extent of the ability that the industry will be able to exert in the industrial and trading reconstructive work that is to come after the war. An industry whose financial condition, through the accumulation of difficulty, has undergone such deterioration in the eyes of investors as has that of the gas industry during the war, cannot hope to command future capital on reasonable terms until position and confidence have been rehabilitated; and this is a matter that affects both the gas consumers and the ordinary stockholders. Already dearer capital is finding its way into the industry in the shape of redeemable debenture and preference stocks carrying rates of interest which ordinary gas stockholders in peace times thought good. The higher interest is an absolute necessity; but to the extent that refuge has to be taken in the issue of such higher interest carrying stocks, the farther recede, in present circumstances, the hopes of the ordinary shareholders of retrieving some part of their lost position, and the greater the weight of the provision for interest that the consumers have to bear. One test of the security of debenture and preference stocks is the dividend position of the ordinary shareholders; the fall of the ordinary dividends induces caution in those who put their money in debenture and preference stocks. Money is going to be dear for a long time to come; and it may be that, more especially if the depreciation of gas dividends and capital is not stopped, still greater inducements will have to be offered to bring new capital into the industry. The effect of this upon existing capital, consumers, and the life of the industry generally, does not require any foretelling or outlining.

The deputation that waited upon the President of the Board of Trade was the outcome of the recent meeting, convened in London by the National Gas Council, of representatives of gas undertakings, at which certain resolutions were passed, embodying the present desires for relief—and modestly framed they are—on the part of sliding-scale and maximum-dividend gas companies, and local authority undertakings. The official report, which adroitly delineates the proceedings before Sir Albert without divulging any details, should be read in conjunction with the remarks on the subject made by the Chairman of the Gas Companies' Protection Association (Mr. Henry E. Jones), at the meeting last Thursday of the subscribers to that body. It will be seen that the deputation, which was supported by Members of Parliament with administrative and other association with the gas industry, was of a composition that could be correctly described as "representative"—all spheres of the work of the industry (financial, administrative, technical, and commercial) being found among the constituents. One thing that gave considerable gratification to the representatives of the companies—and this was a point commented upon by Mr. Jones at the meeting referred to—was the support rendered by the large municipal gas undertakings to the appeal of the companies for relief. Of course, the municipalities are interested in the result of the appeal to the Board of Trade. They will probably have to go themselves to the Local Government Board to obtain some relaxation of their conditions; and whatever the issue from the Board of Trade deputation, it must have considerable influence on their own future efforts. All the same, the presence before the President of men of very high position in the municipal world was significant of the unity of interest which to-day exists in the gas industry, and which was not evident but a few short years ago.

The case for the consideration of Sir Albert was plainly and cogently put by Mr. D. Milne Watson, the Chairman of the Executive Committee of the National Gas Council. He knows every detail from A to Z of the causes of the present financial position; and he arranged them before the President in a manner that gave strong emphasis to the considerable weight of the combination, which has been capped by the last half-a-crown addition to the price of coal, with the overhanging uncertainty as to this representing finality. The peculiar position of the industry was traced, which showed that the larger the business done under prevailing circumstances, the greater the loss to the industry, and yet the industry, in the national interests, must keep pace with demand, and even foster it, in order to provide to the fullest possible extent the requirements of the Ministry of Munitions for both explosives and liquid fuel, and of the Board of Agriculture for sulphate of ammonia. The financial effects of these several causes were shown; and the suggestions contained in the resolutions lately passed, were duly submitted. Considering the interest paid on the War Loan, the height of the income-tax, the current purchasing power of money, and the accrued burdens of the times upon individuals, the President must have been impressed with the moderation of the requests—that sliding-scale gas companies should be allowed to pay their stockholders 80 p.ct. of the difference between the reduced dividend payable under the sliding-scale and the pre-war rate of dividend, or alternatively the standard dividend, whichever may be the greater, and in the case of other companies the right to raise their authorized maximum prices by 6d. In all these proposals selfishness is wholly absent.

The matter is one the President could not be expected to deal with summarily. He is considering the matter; but there is the evidence that he is already satisfied with the justice of the industry's case, and that he himself is hopeful of some manner of effecting relief being discovered, in the proposal he made that a small Committee should be selected from the deputation for the purpose of further discussion. One thing appears to be clear from Mr. Jones's remarks at the Gas Companies' Protection Association meeting, that the promotion of a General Bill would be difficult, and would take too much time, seeing that the relief is a matter of such

urgency. However that may be, it is unthinkable that the Government cannot find some mode of dealing with such a situation as that to which the gas industry has been brought through circumstances beyond its control, and by the trading conditions to which it is tethered by pre-war legislation and the wartime regulation of prices and export of its secondary commodities, in dealing with which there was formerly complete freedom.

The Economy of Steaming in Continuous Vertical Retorts.

The change from the illuminating power standard for gas to the calorific value one has opened up to the gas industry an opportunity for advancing its interests such as has never before presented itself. For years prior to the war, the industry had been striving to bring to the credit of its working all possible small manufacturing economies, to add to those that accrued from the extension of business; but the workers for these economies had the mortification of seeing them largely absorbed by the persistent accretion of the costs of materials and other outgoings. However, the calorific value standard has destroyed an obstinate obstruction in the path to a better chance of realizing gas production on a cheaper scale than would be possible, in the circumstances prevailing at any time, by following the old hard-and-fast lines of manufacture. Dilution with blue water gas and steaming of charges are old plans for legitimately increasing the make per ton; but, with the calorific value standard in existence, they have been raised to a higher eminence as practical sources of economy. Both systems have their advocates; and their adherents will have numerical progression with the growth of experience. Steaming, however, is a practice that promises to combine better with the vertical retort than with the horizontal; and blue water gas will possibly find its largest application as an accompaniment of horizontal working, with application also where engineers have any aversion to interfering with the original operations of the vertical retort. So far the question of economy by the adoption of these processes has been looked at by some engineers as being concentrated in the quantity of mixed gas that is produced per ton of coal. They must extend their horizon in this connection. With either blue water gas or steaming, the increased production of gas made per ton of coal means reduction of the quantity of coal purchased, carried by rail or sea, handled and (in part) stored. It means, too, a decrease of capital expenditure on carbonizing plant and coal storage provision in relation to production, and a diminution of wear and tear and labour charges; these last-named items being probably reduced more in the case of steaming than in that of blue water gas with its separate plant. All such manufacturing savings are valuable, with progress depending so much on economies which will strengthen the commercial situation.

Up to the present, there has been comparatively little work done with steaming in continuous vertical retorts. Experience has been largely with verticals of the intermittent type—the steaming taking place at the end of the carbonizing period. With continuous verticals, a small amount of steam has been admitted to the retort coke chambers before discharging their contents; and in this way a modest amount of water gas has been made. Yet the continuous type of verticals, through gas production proceeding in them with almost monotonous regularity—giving those even calorific curves that have been so frequently seen—lend themselves particularly to continuous steaming, with effects unrealizable with intermittent steaming. It is obvious that with continuous steaming in such retorts, the mixed gas will also be of uniform composition and quality under given conditions; and there is every reason now to believe that continuous steaming has an accelerating and protecting influence that finds expression in the increased value of products per ton of coal carbonized, and in the fact that the percentage calorific value of the gas is only slightly reduced, though the make is largely increased. That there is a good case for uninterrupted but regulated steaming in continuous verticals is shown by Mr. J. E. Blundell, of Macclesfield, in the paper that he read on Saturday at the meeting of the Manchester Institution of Gas Engineers; and henceforth he will have to be regarded as a pioneer in continuous steaming with Glover-West retorts. There has been some experimental work before in this direction with continuous verticals; but it has not, to the best of our knowledge, been carried out by giving any practical effect to theoretical considerations as in this case. Much credit must be given to Mr. Blundell for the painstaking way he set to work in the matter, and has produced a success of a very substantial character, confirmed by the working of five months, by proceeding from theoretical considerations to practice, and not by attempting to achieve his end merely by haphazard experiment.

Temperature and the location of the highest temperatures are important contributors to success. In order to complete the water-gas reaction, and to ensure that there is not a considerable increase in the CO_2 content of the gas, the zones of highest temperature must be transferred to lower points in the lengths of the retorts. If the diagram accompanying the paper is examined, it will at once be seen that the combustion temperatures in the six combustion chambers have been raised by from 130° to 200° C., with the result that the average temperature in the top or sixth combustion chamber is 1300° C., in the fifth chamber 1380° C., in Nos. 4, 3, 2 1400° C., and in the bottom chamber 1350° C. The paper must be consulted to ascertain the details of what changes in working were essential to secure these higher temperatures. To maintain regularity of the temperatures, special attention has to be paid to the systematic cleaning-out of dampers and flues; otherwise there would be a drop of temperature which would increase the CO_2 content of the gas. Again, with the view of permitting the water-gas reaction to take place satisfactorily, it is necessary to reduce the speed of the extraction of the coke by some 10 p.ct. This, of course, means that, notwithstanding the higher temperatures, the *carbonizing* capacity of the retorts is reduced, though the *producing* capacity in mixed gas is increased by some 25 p.ct. With such a large additional make of gas, it would be an advantage to have the outlet valves and pipes increased in size; seeing that, with their existing area and the greater gas production, it is necessary, in order to secure a level gauge at the top of the retort, to maintain a pull of ⅛-10th to ¼-10th on the inlet of the retort-house governor. Care has also to be taken—this is as important as the rest of the conditions—to see that the steam pressure is correct for the coal that is being carbonized. If not, using the same steam pressure for different classes of coal, the results would be widely divergent—due to the altered character of the coke. For instance, a hard dense coke requires a greater steam pressure than a coke of a lighter character. Therefore, when changing from one class of coal to another, it is necessary to closely watch the composition of the gas, and regulate the steam supply accordingly. From these points it will be seen that steaming is not a mere question of utilizing existing conditions, and passing in regularly a certain quantity of steam, but precautions have to be taken so as to ensure success. In other words, the gains are not to be secured without some amount of trouble.

When one studies the results presented in the paper, it is obvious that they could not have been realized without the steaming itself had produced some genuine improvement upon the complex work proceeding within the retort. The results point to a reduced degradation of the hydrocarbons in the gas. When the retorts are now let-down for scurfing after the same period as before steaming, it is found that the scurf is not half as thick as in ordinary working; there is little indeed at the bottom of the retorts, and, such as there is, is friable and quite porous. Touching this point, it is evident to Mr. Blundell that the scurf is directly acted upon by the steam, and provides some of the carbon necessary for the conversion of CO_2 to CO in the water-gas reaction. And we should imagine that there is actually less scurf formed. Then, further, the steaming would have the effect of promptly washing-out the tar vapours, and so preventing their destructive distillation. Also it may be taken that the hydrogen of the water gas would be at a sufficient temperature, and would be in contact with the body of the coke in the retort for a sufficient time, for ammonia to be produced in accordance with Tervet's reaction.

Following such reasoning, the actual results will be scrutinized narrowly by gas engineers. In the first place, they will find that, whereas before steaming the average make from Yorkshire coal was 12,049 c.ft. of 530 B.Th.U. gas (6,385,970 B.Th.U. per ton), with a mixture of Yorkshire, Derbyshire, and Staffordshire coal and steaming it was, taking the average of the five months' working, about 15,500 c.ft. of 510 B.Th.U. gas (7,905,000 B.Th.U. per ton), with the total incombustibles at 10·45 p.ct., as compared with 10·7 p.ct. before steaming. These percentages are, however, the result of rapid tests made for comparison

and adjustment of the steaming operations. A longer test shows average incombustibles of 7·87 p.ct., which is excellent. What, however, will strike most engineers about these figures is the small reduction of calorific value per cubic foot as compared with the large additional gas and B.Th.U. production per ton of coal. Other data show an increase of 10-oz. ammoniacal liquor from 25·3 to 32·68 gallons; and of tar produced, from 10·9 to 16·61 gallons. Per ton of tar, the ammoniacal liquor, crude benzol, middle oil, and heavy creosotes are also up, compared with the results from tar without steaming. The 90's benzol and toluol, solvent naphtha, and tar acids present their increases. Crude pyridine is slightly lower, total creosote higher, while pitch is less. The coke made per ton before steaming was 13·6 cwt.; and with steaming 13·36 cwt. Its calorific value is put at 12,700 B.Th.U. per lb. (which is fairly low); and it is dry, hard, and of clean grey appearance.

A point that has exercised some engineers has been the effect on fuel consumption. It goes without saying that it is somewhat higher per 100 lbs. of coal carbonized; but if worked out to per 1000 c.ft. of gas produced, a different tale is told. One test gives 11·5 lbs. per 100 lbs. of coal carbonized; another, 10·95 lbs. Taking the thermal efficiency of a setting at 30 p.ct., the additional fuel works out to 25·3 lbs. per ton of coal. The fuel required to generate steam is put at 24 lbs. per ton of coal. The carbon converted into water gas in the retort is calculated at 25 lbs.; so that (this is putting the figures on the high side) the loss of coke for sale per ton of coal is about 74 lbs. It is probable that the actual reduction is about ½ cwt., which is a small figure compared with the results in gas and ammoniacal liquor and tar quantities and qualities. With developments in utilizing the waste heat of retort-settings, we hope to be able to look for the disappearance of the fuel used for the generation of steam. A further question that has been frequently raised is as to whether steaming has any deleterious action upon the retort material. In this respect, there has not so far been any noticeable trouble at Macclesfield.

From the results presented by Mr. Blundell, it looks very much as though, in continuous vertical retorts, steaming should be regarded as an integral part of the process, in order to get the utmost possible out of both the retorts and coal. There are also indications in the paper that there are possible developments which may lead to the further raising of the already high thermal efficiency of the system. A table towards the end of the paper shows that, under this process of continuous carbonization with steaming, the thermal efficiency is 85·84 p.ct., which is something our electrical competitors will regard with envy, in view of the poor showing that they are themselves able to make. Towards the end of the paper Mr. Blundell gives the saving in net cost of coal effected by steaming with a gas output of 200 million c.ft., and taking the coal carbonized at £1 per ton in both cases, less the value of residuals at equal figures. The net saving is £1264. But there is the saving of 3577 tons of coal in the quantity purchased, carried, handled, and carbonized. The quantity of residuals is reduced; but we can do with less, especially if gas consumption is going to largely increase—at any rate, it is so in regard to coke, the commercial status of which in peace times wants improving. There is, too, the less capital expenditure on carbonizing plant per unit of gas production; and the saving of wear and tear on the plant that would otherwise be required, as well as the labour needed. Mr. Blundell has made out a good case for the economy of steaming; and it is obvious that he has, in his paper, tried, by giving full information, to disarm criticism. We have no hesitation in saying that here we have one of the best contributions published lately on the all-important subject of gas-producing economy.

Gas on the Road.

In the notes that appear in our "Miscellaneous News" columns on the subject of gas for motor vehicles, it will be observed that the Petroleum Executive, writing through Mr. E. S. Shrapnel-Smith, their Economy Officer, are persuaded that there are still gas managements who do not realize that the great difficiency of our means of internal transport and the position of the petrol supply render the provision of the necessary facilities for furnishing gas to motor vehicles a matter of the greatest urgency. This (like other questions with which the gas industry has been faced) is of such national importance that everything possible must be done to prevent a further decline in our road transport facilities, and, if possible, to enlarge them by bringing into use again vehicles that have been placed on the unemployed list through the lack of petrol. Of course, there are some gas undertakings with producing power unequal to the strain of any further tapping of their mains for supplies for fresh service; and there are others that could afford supplies, but dare not, owing to the present position of their coal stocks. A majority of concerns are, however, in a position to take fresh custom. An inquiry is being made for the purpose of giving the Petroleum Executive information as to the gas-works that are moving in the matter of motor supplies, or are on the point of providing filling and refilling stations; and in the case of the undertakings that are not in a position to supply, it is desired that the reason shall be stated. This inquiry is being made through the British Commercial Gas Association, who are also, at the request of the Commercial Motor Users' Association, circularizing gas undertakings, with the view of (we take it) compiling a sort of guide for the users of motor vehicles, which will give them the addresses of all points at which gas may be obtained for filling car containers, particulars as to charges, and other information. If such a compilation is kept up to date, it will be very valuable in the development of this business. What with the Ministry of Munitions (through it the War Office and the Admiralty), the Petroleum Executive, and the Board of Agriculture, the gas industry is being found (valuable as it is in times of peace) an exceptionally valuable institution in times of war. It is hoped that in the coming peace time, there will be a considerable reward for the industry arising out of all the new experience in the providing of which it has had such large hand. While writing, reminder may be given of the discussion to take place, on the subject of gas for motor vehicles, at the annual meeting of the British Commercial Gas Association to-morrow. The occasion promises to be one of much interest.

Federation of British Industries.

It was felt that there was good cause for self-congratulation at the annual meeting of the Federation of British Industries, on which occasion there was placed before the four hundred or so representatives present the results of the first year's operations of this young, but vigorous, organization. With a large and increasing membership and ample funds, the prospect is confidently regarded of the Federation being able to prove itself a power for good in the welfare of the Empire. There are many questions in which a body of this kind may quite legitimately interest itself; and on two of them special stress was laid by the outgoing President—Mr. F. Dudley Docker, C.B. The first is the policy of protecting our trade against foreign aggression; the second, the relation which education must bear to industry. Having formed a strong opinion that many grave difficulties between employers and workpeople have their origin in lack of knowledge, he urged that the Federation should concern itself particularly in fostering in no niggardly spirit the spread of education. A gratifying point in the statement was the intimation that recognition has been obtained by the Federation from the Government. The Prime Minister had, in fact, authorized Mr. Docker to say he would welcome any federation of industry, and expressed the opinion that such an Association would be of assistance to any Government. The new President is Sir Richard Vassar-Smith.

New York and the Calorific Standard.

The Public Service Commission (First District) of New York are considering the questions of a calorific standard for the city and the price of gas that shall rule on a change being made. They seem, however, to be obsessed by some notion as to the prescription of a standard of calorific power that shall be the equivalent, of the old illuminating power standard. In changing from an illuminating power to a calorific power standard, it would be well if they took the preliminary step of dismissing from their minds that such a thing as illuminating power exists as a property of gas. It is not a necessity with modern gas-consuming appliances, and therefore can be entirely abandoned. The uses of gas to-day demand a gas of good combustible properties, which will give a high flame temperature. The best gas is not necessarily the gas of highest calorific value; it is the gas that will upon combustion under the conditions of use render the best service to the consumers at the lowest cost. While Parliament has decided upon a standard of 500 B.Th.U. (total heat value), there are engineers in

this country with their minds set on the supply of a gas for fuel purposes which is suitable also for incandescent burners, with a calorific value below 500 B.Th. U., and this without the use of oil for carburetting. The Public Service Commissioners of New York should start *de novo* in considering the question of a calorific standard, and not try to effect a junction with the old illuminating power standard, and work from that point. The application of gas as a heating agent (even for incandescing mantles) has nothing to do with its old flat-flame luminosity. New conditions and new considerations now obtain.

Engineering Training.

With all the writing and the rhetoric that have been expended over the subject of the training of engineers, a satisfactory conclusion has not been reached. Most men with an intimate knowledge of engineering have their own views as to the correct route to engineering status, and are very well satisfied with them; but there is so much disagreement that chaos in the matter continues to reign. The Government has done little or nothing in the matter. It has not hitherto been regarded as the business of the Government to assist industry; and every manufacturer, company engineer, and every parent has claimed the right of perfect freedom to pursue his own course of action in this as other matters, come what may. Effort, however, is again being put forth to rescue engineering training from this disorder, and to give it proper form—not that we believe any individual can have his training made the subject of a complete specification from which there can be no departure. At the same time, there is scope for improvement; and at a meeting held last Thursday at the Institution of Civil Engineers, the question was discussed of the establishment of a central organization to consider among other things the co-ordination of engineering training, including the fostering of apprenticeship as a national institution, and the consideration of means whereby the work period of an engineering pupilage may be increased in efficiency. There can only be co-ordination of the fundamental part of the training; in the specialization which follows, co-ordination must naturally be banned, except in so far as the work of an industry will allow. However, we welcome, as did the meeting (at which Mr. A. E. Broadberry represented the Institution of Gas Engineers), the suggestion of a central organization. Nothing should stand in the way of a genuinely useful scheme that will make for higher technical efficiency in the *personnel* of engineering works. Higher peace-time expenses confront British industries, despite which they desire to have a bigger place in the markets of the world. Technical efficiency must largely be the driving force.

Imported and Home-Produced Petroleum.

In a recent week (the "Petroleum Review" states) the total imports of petroleum into the ports of the United Kingdom fell to a figure which only just exceeds 1¼ million gallons. In normal times, the weekly imports are about 8 million gallons—a figure that was reached last week for a change; but lately in some weeks they have been approximately 2 million gallons. The figure first mentioned is the lowest within knowledge. From imports to possible home-derived supplies, the Petroleum Production Bill launched by the Government to enable the quest for natural petroleum in this country has passed its second reading; and the House considered its clauses last week. In one respect, the Government, in a small House, sustained a defeat. The Bill has been framed with the idea of making a careful survey for natural oil for national purposes; and it provided for the creation of a fund, by the payment into it of 9d. per ton of oil obtained, from which, it was proposed, a royalty should be paid to the owners of the land from which the petroleum is raised. A number of members of Parliament objected to this, and considered that the 9d. per ton should be utilized to help defray expenses. The ground of the objection is that, as this is a new venture taken up nationally, the results should be vested in the Crown for the benefit of the people. If the principle is good, that Nature's gifts should be the property of the nation, it should have been applied to coal long ago, except that there is the difference that this petroleum exploration work is to be undertaken by the nation, and from the nation's work private individuals should not benefit. In a small House on Thursday, the objectors carried an amendment substituting for "into the Petroleum Royalties Fund" the words "of expenses incurred by or on behalf of His Majesty." If this amendment stands, the people from under whose land the petroleum (if any) is secured, will have to whistle for royalties; and there is quite a large number of members in the House who are of opinion that the landowners who have neglected this work do not deserve anything. Times are changing; and the doctrine of communism is spreading.

Home Dye Developments.

Although British Dyes Limited are paying their maximum dividend of 6 p.ct., although good progress is being made in increasing the range of dyes produced, although the Company's plant has been largely extended, although auxiliary plants—gas, electrical, and water—have been constructed, and although increased facilities for research and experimental work have been provided and the plans prepared for the construction of the main research department, there is, in the annual report of the Directors, a note that conveys the feeling that there is very much more to be done before dye-making can be regarded as a national industry in this country. There is a distinct feeling of insecurity prevailing, although many people thought that, with the backing given by the Government, all would be well. The new venture is working against the obstacles created by the war. The very products that are wanted by British Dyes as base materials are also needed for war purposes. A pressing requirement is plant for the manufacture of intermediate products; and such provision as has been made has largely devolved upon the Company. Much has been done; but that much is only regarded by the Directors as a beginning, which shows that the way is long, and the work great that has yet to be accomplished, to make the country self-sustaining in this respect. The Board deplore the limited means of the enterprise; but under war conditions—the position of materials and labour—it is doubtful whether the Company could, even had they the money, have gone along faster than they are doing. The Directors appear to see a crushing strength in the financial position of the German dye firms; for at the end of the report it is remarked: "The need for the employment of greatly increased capital is emphasized by the fact that the recently published accounts of five of the German dye-manufacturing firms show assets which amount in the aggregate to upwards of 35 millions sterling, including cash resources of approximately 10 millions sterling." That may be quite true. But here time and opportunity are the real troubles, as, for a country that has shown such financial resources as this, there should be no difficulty in providing, when they can be used, sufficient millions to satisfy our own dye requirements, and to let Germany know that her assistance in this respect is no longer necessary.

Effusion Method of Determining Gas Density.—A copy has been received of Technological Paper No. 94 of the United States Bureau of Standards, at Washington; the subject dealt with being the "Effusion Method of Determining Gas Density," by Junius D. Edwards, Assistant Chemist. The matters dealt with in the pamphlet were noticed at length in the "JOURNAL" for July 17 last, p. 108.

Fatigue Tests on Compressed Gas Cylinders.—In connection with an investigation of the causes of failure of some compressed gas cylinders, a special fatigue test has been devised by the National Physical Laboratory, by means of which the pressure inside a cylinder is caused to alternate between fixed limits. For this purpose, a reciprocating plunger is fitted to a receiver connected to the delivery pipe of the hydraulic pump which maintains the desired pressure inside the cylinder under test; and, by varying the stroke of the plunger, the range of pressure can be set to the required limits. In the particular cases tested, the pressure ranged from 200 lbs. to 400 lbs. per square inch; and it was found that failure ultimately took place by the development of cracks in the joints which would withstand a single application of a load many times the above value.

Nitrogen Fixation in America.—An announcement has been made by the United States War Department to the effect that the Nitrate Supply Committee recommend the Government to use the synthetic ammonia process of the General Chemical Company, and to build a plant having an output of 60,000 lbs. of ammonia per 24-hour day, as well as a plant to oxidize ammonia to nitric acid and concentrate the acid, the output being equivalent to 24,000 lbs of 100 p.ct. nitric acid per day. A sum is asked for, to experiment with a view to the industrial development of the Bucher process for the production of ammonia which is owned in the States by the Nitrogen Products Company. The installation of bye-product coke-ovens is also to be accelerated. The decision as to the more extensive installation of nitrogen fixation processes and water-power development in connection therewith is to be postponed until these plants are in operation.

NATIONAL GAS COUNCIL.

Financial Hardships of Gas Undertakings.—Deputation to the President of the Board of Trade.

[OFFICIAL REPORT.]

Important meetings of representatives of gas undertakings, supported by Members of Parliament, took place in London on Wednesday last, in connection with the question of the financial hardships of gas undertakings.

REPRESENTATIVES.

The following gentlemen were present at a meeting at the Institution of Gas Engineers, held to decide the procedure to be followed by the deputation to the President of the Board of Trade later in the day:

Sir Joseph Bellamy, J.P., Plymouth and Stonehouse Gas Company.
C. Valon Bennett, Southern District Association of Gas Engineers and Managers.
J. H. Brearley, Manchester and District Institution of Gas Engineers, Yorkshire Section.
A. E. Broadberry, M.Inst.C.E., Tottenham District Light, Heat, and Power Company.
Chas. Carpenter, D.Sc., South Metropolitan Gas Company.
H. Wade Deacon, J.P., Liverpool Gas Company.
James R. Duff, Midland Association of Gas Engineers and Managers.
T. H. Duxbury, North of England Gas Managers' Association.
F. W. Goodenough, The Gas Light and Coke Company.
Thomas Goulden, The Gas Light and Coke Company.
C. Grimwood, Eastern Counties Gas Managers' Association.
T. Hardie, Newcastle-upon-Tyne and Gateshead Gas Company.
D. H. Helps, M.Inst.C.E., Reading Gas Company.
J. R. H. Jacobs, F.C.I.S., F.S.A A., Southern District Association of Gas Engineers and Managers.
A. A. Johnston, Brentford Gas Company.
H. E. Jones, President Inst C.E., Wandsworth, Wimbledon, and Epsom District Gas Company.
Alderman William Kay, J.P., Manchester Corporation Gas Department.
J. E. Kenshole, Wales and Monmouthshire District Institution of Gas Engineers and Managers.
Alderman F. S. Phillips, J.P., Borough of Salford Gas Committee.
W. E. Price, Assoc.M.Inst.C.E., Hampton Court Gas Company.
T. P. Ridley, North of England Gas Managers' Association.
H. A. Stibbs, Portsea Island Gas Company.
J. H. Troughton, Eastern Counties Gas Managers' Association (Eastern District).
E. Upton, F.S.A.A., Manchester District Institution of Gas Engineers—Lancashire Commercial Section.
Thos. Waddom, North of England Gas Managers' Association.
D. Milne Watson, The Gas Light and Coke Company.
C. Wood, Manchester District Institution of Gas Engineers—Yorkshire Commercial Section.

The following Members of Parliament were present to give the movement their encouragement and support:

Sir W. H. Cowan, M.P.
The Rt. Hon. Sir Daniel F. Goddard, M.P.
R. J. Neville Neville, Esq., M.P.
W. F. Perkins, Esq., M.P.
Sir J. Fortescue Flannery, Bart., D.L., (who joined the deputation at the Board of Trade).

The President of the Board of Trade had also arranged to deal at the same time with the position created by the withdrawal of leaving certificates, various matters concerning electric tramways, and the suggested revision of the sliding-scale—representatives appearing on behalf of various electricity and electric tramway undertakings throughout the country.

THE OBJECT OF THE DEPUTATION.

The Rt. Hon. Sir DANIEL FORD GODDARD, in introducing the deputation to the President (Sir Albert Stanley) on behalf of the gas industry, stated that the deputation represented some £85,000,000 of capital.

Sir Daniel briefly reviewed the position as applied to:

(*a*) Sliding-scale undertakings.
(*b*) Maximum-price undertakings.
(*c*) Corporations and municipalities.

He pointed out the serious position in which war conditions had placed these concerns. The deputation was there that day only to ask for a reasonable return on capital.

Sir FORTESCUE FLANNERY desired to identify himself with the application, which he believed was founded on justice and national interest. In his opinion, some assistance was absolutely necessary if the gas industry were to continue not merely its ordinary supplies, but its assistance to the various Government Departments. He (Sir Fortescue) was glad to see Mr. Kellaway next to the President, because he could testify as to what the gas industry had done for the country. Sir Fortescue assured the President that he could listen with every confidence to the statements of the members of the deputation.

Mr. D. MILNE WATSON (the Chairman of the Executive Committee of the National Gas Council) then addressed the President at length on the whole case, pointing out that it was understood that the withdrawal of leaving certificates could not be reconsidered, and the only way of dealing with the matter was by financial relief of gas undertakings. At a large meeting of representatives of gas undertakings held in London on the 9th ult., a series of resolutions were unanimously passed, containing proposals for the consideration of the President. The recent further increase under the Price of Coal (Limitation) Act was referred to, and figures were quoted showing the enormous additional cost to the industry. It was pointed out that the inferior quality of much of the coal received was the cause of difficulties in working. Other difficulties were the increased cost of oil, freights, materials of all kinds, and of labour. There was also the restriction by Government control of the prices of residual products. Ordinary undertakings placed in such a position could easily rectify it by raising the price of their commodity or by restricting their output; but if gas undertakings revised their prices, they would (under the operation of the sliding-scale provisions) have to sacrifice dividend. They were not able to restrict their output—in fact, the Government were urging the public to use gas, at the industry's expense.

The suggestions were then put before the President, which may be briefly summarized as follows:

That companies be allowed to pay 80 p.ct. of the difference between the reduced dividend payable under the sliding-scale and the pre-war dividend, or, as an alternative, the standard dividend—whichever may be the greater.

Maximum dividend companies and local authorities—that the maximum price be raised by 6d.

And instances were quoted to show the operation of these proposals. Reference was made to the reduced value of capital, and the difficulty there would be in raising fresh capital economically—thus greatly handicapping the industry. Mr. Milne Watson stated that gas undertakings were doing all they could to produce large quantities of toluol, &c., for the Government, and were only asking what they considered simple justice.

Mr. H. E. JONES said he spoke as President of the National Gas Council. The increasing grievances and hardship could not be in the interest of the community at large; and he sincerely hoped the President would see his way to grant the request made that day.

Mr. J. R. H. JACOBS said maximum-dividend companies represented a capital value of £26,000,000. The average dividend paid was 5 p.ct., and a number of companies had already reached their maximum price. Owing to the increasing expenses, there was only a very small reserve; and once this was drawn upon, there would be little or no dividend. He asked that the extra 6d. should be granted in order to enable them to sell their gas at a price which it cost to produce.

THE SUPPORT OF CORPORATION UNDERTAKINGS.

Alderman PHILLIPS said he represented municipal gas undertakings and was a member of the National Gas Council. After the very clear statements made, he would confine himself to one sentence. On behalf of municipal gas undertakings, he could say they gave a most cordial and hearty support to the proposition put before the President on the grounds of its necessity and equity. He hoped the President would give assent to the appeal made.

THE PRESIDENT'S REMARKS.

The PRESIDENT OF THE BOARD OF TRADE stated that he realized the seriousness and importance of the problem, but he was sure the members of the deputation would agree that it would be impossible for him to give a definite answer that day. The matter should receive his very careful attention, and would be dealt with expeditiously. He advised the selection of a smaller Committee from the deputation for the purpose of discussing the matter. With regard to the cancellation of leaving certificates, Sir Albert Stanley asked for information as to the effect of this order as soon as statistics are available.

Stanton Iron-Works.

The Right Hon. George Roberts, M.P., P.C., lit up on Saturday week the last remaining idle furnace at the Stanton Iron-Works, which has been placed in commission for making basic pig iron out of local iron ore, for purposes of steel makers. The manufacture of basic pig iron out of local ore is a new industry in the Midlands; and not until the shortage of raw materials for steel making had made itself felt, were the Midlands called upon to divert their blast-furnaces to the manufacture of basic iron. It is of interest to note that, under normal conditions, these furnaces remain in continuous operation for some fifteen years before requiring relining. The Stanton Company have now in commission nine furnaces, and supply their own iron ore and coal, &c.

Co-Operation between Employers and Employed.—In July last, a circular-letter was addressed by the Ministry of Labour to all the principal Employers' Associations and Trade Unions, asking for their views on the proposals made in the report of the Whitley Committee on Joint Standing Industrial Councils. As a result of the large number of replies which have been received, generally favouring the adoption of the proposals, the War Cabinet have decided to adopt the report as part of the policy they hope to see carried into effect in the field of industrial reconstruction.

Manchester and District Junior Gas Association.—On the invitation of the Manchester Corporation Gas Committee, members will attend a lecture and demonstration by Mr. Forshaw, of Birmingham, next Saturday afternoon, at 3 o'clock, in the Furnace Show-Rooms, Whitworth Street. Refreshments will be provided by Messrs. John Wright & Co. In the evening, papers will be read by Mr. E. W. Wilson, on "The Care and Maintenance of De Brouwer Stoking Machinery," and by Mr. J. H. Clegg, entitled "Some Observations on Benzol Extraction at Gas-Works." There will also be a special meeting to consider proposed alterations of certain rules.

PERSONAL.

Mr. ARTHUR BROMLEY, Manager of the Batley Corporation Gas-Works, has been appointed the local Coal Control Officer.

Mr. George HALE, who has been Manager of the Kinvale Gas-Works since 1908, has been appointed Manager of the Netley War Department Gas-Works.

A very wide circle of friends will be gratified to learn that Mr. ANDREW MACKENZIE, who has been associated with the business of Messrs. Alder and Mackay for nearly forty years, has now been made a Director of the Company.

Mr. CHARLES WHITFORD LEAKE has been appointed Chairman of the Wellington (Salop) Gas Company, in place of the late Mr. Harry Shepard, whose death was recorded last week; and Mr. R. J. MILBOURNE, of the firm of Messrs. C. & W. Walker, Ltd., has been elected Vice-Chairman.

Mr. HERBERT BANYARD, Works Manager at Saffron Walden, has been appointed Manager of the Haverhill Gas-Works, in succession to Mr. F. C. TROUGHTON, who has resigned. There were over a hundred applications for the position. The salary is £150 per annum, with gas, fuel, and house.

From among about fifty applicants, Mr. D. J. BRANSON has been selected to fill the vacant position of Gas Engineer to the Pontefract Corporation. In June, 1914, he was appointed Assistant Engineer to the Kettering Gas Company, and at the end of the same year joined the Army. Subsequently he received a Commission; but ill-health obliged him to relinquish it, and recently he has been an Engineering Assistant at the Halifax Gas-Works.

Intimation having been made to the Gas Committee of the Glasgow Corporation of the death of Mr. J. LESLIE MURRAY, C.A., who was Auditor of the accounts of the Gas Department, the Committee agreed that Mr. DAVID ALLAN HAY, C.A., be appointed Auditor for the period up till May 31, 1920, at the same remuneration as was paid to Mr. Murray—viz., £210 per annum—and subject to the appointment being approved by the Secretary for Scotland.

After having filled the position for three years, Sir THOMAS DUNLOP, Bart., is retiring from the Lord Provostship of Glasgow. So far as is known at present, there will be only two candidates—ex-Bailie THOMAS PAXTON (well known to the gas industry generally as a former President of the British Commercial Gas Association) and ex-Bailie J. WATSON STEWART. A very close vote is expected; both gentlemen having taken a prominent part in municipal work, and having rendered valuable services to the community.

We regret to learn that, owing to ill-health, Mr. WILLIAM MARTIN is retiring from the secretaryship of the Continental Union Gas Company. Mr. Martin has completed over fifty-one years' service, having been with the Company since 1866, and has filled many positions. During the Franco-German war of 1870, when at Vienne, near Lyons, owing to staff depletion, he often lent a hand in the retort-house work. For many years he was chief of the Company's agency at Genoa. He was called to the London office in 1887; and, on the retirement of Mr. F. W. Himing in 1904, he was appointed Secretary. He is a master of both Italian and French, and possesses an intimate knowledge of the intricacies of Italian Commercial Law. His retirement will be a great loss to the Company, whom he has so long and faithfully served. The Board have appointed as Secretary Mr. EDWIN CHARLES BODE, who has been for many years connected with the Company.

OBITUARY.

Mr. H. J. WOODFINE, the Manager and Accountant of the Wellington (Salop) Gas Company, has sustained the loss of his second son, Charles Stanley, who was killed in action in Belgium on the 19th inst., at the age of 19 years and 5 months. The lad on the outbreak of war mobilized with the Shropshire (Territorial) R.H.A., at the age of 16½, and has been in France since January of this year, serving through the battle of Arras and the heavy fighting round Bullecourt. Since September he has been in the Ypres sector. His eldest brother is serving in the same battery.

Mr. GEORGE WILSON, Gas Engineer and Gas-Meter Manufacturer, &c., who passed away on the 21st inst. at Brompton House, Coventry, at the age of 76, after an illness extending over some weeks, was born in London, and went to Holland in 1872 in the service of the late Sir John Aird, who had the contract for laying down the gas-mains in The Hague, Amsterdam, and Leiden. After Sir John Aird had completed the work, he took no further contracts in Holland; but Mr. Wilson joined Sir John's successor, Mr. Ward, who carried out contracts for the laying of gas and water mains in many places. In 1878, Mr. Ward ceased to take contracts; and Mr. Wilson continued the work on his own account, enlarging the mains in The Hague, Haarlem, Amsterdam, Leiden, Dordrecht, &c. Six years later, Mr. Wilson started a small works in Rotterdam for the repairing of gas-meters. This was transferred the year after to The Hague; and the manufacture of new meters was also undertaken. It was a very small start; but extensions were soon needed. The exceptional quality of the articles made were appreciated; and at the exhibitions at Amsterdam, Gouda, Brussels, &c., the highest awards were obtained. In 1905, works were erected in Coventry and Brussels; and very shortly afterwards it was found necessary to enlarge the former by the addition of machine-shops and a foundry. In 1908, works were erected in Oisterwyk; and in 1916 others were started at Manchester—many hundreds of men being employed in connection with Mr. Wilson's various undertakings.

ELECTRICITY SUPPLY MEMORANDA.

THE electrical papers are not jubilant over the report of the Board of Fuel Research. They are mildly polite; and the little one of the family obliquely tells the Board to stick to their own business, and then let the professional electricals do the rest so far as their own work is concerned. The "Electrical Times" is not convinced that the Board can produce any valuable new evidence as to how a boiler-house should be arranged, and where the electric power station should be. The Board have never, to the best of our knowledge, regarded these questions as coming within their purview. One of the problems the Board pointed out as awaiting solution is, "Can electric power be obtained more cheaply if the coal used for steam-raising is first subjected to processes of carbonization and gasification?" "Meteor" refers to this as "one of the little problems the Research Board means to throw off quite incidentally." The members of the Board, we think "Meteor" must confess, are not, technically or commercially, such a set of fools as to "throw off quite incidentally" anything of such importance. However, the wise "Meteor" advises the Board to limit its mandate. "It should present its analyses and recommendations as to various fuels in varying conditions. *It should not set out to decide for us.* Can electric power be obtained more cheaply? This question involves capital charges which are even mightier than fuel." But up to the present, what have electrical engineers done to justify confidence that they will not make a further mess of things electrical? It is frankly proclaimed throughout the electricity supply industry that the reformation sought to-day is due to the mighty incompetence of the past in not having technically ordered things differently. Is the present generation of electrical engineers wiser than those who laid the foundations of the industry? They have larger experience; but experience has its limits. "Look before you leap" should be prominently posted up at those limits.

Board of Fuel Research Report.

Now there is the glamour of pre-carbonization of coal before committing part of its corporeal self to the object of generating electricity. But where are the electricians who have such knowledge and experience of carbonization and the resulting products that they can pronounce any opinion on the subject in all its manifold aspects, and say whether or not the carbonization of coal by them will be better than acting co-operatively with existing coal carbonizers? Our contemporary, "Electrical Industries," does not appear to hold a high opinion as to the qualifications for judgment of electrical engineers on these matters, for it writes:

Low-Temperature Carbonization.

> We may refer to the discussion on Mr. Robertson's paper before the Incorporated Municipal Electrical Association for proof, if proof be required, that a long road has yet to be made before we come in sight of agreement on the first principles of coal carbonization at low temperatures. Each expert has his own views on the matter, because he approaches a complex series of processes from the standpoint of a particular item or a particular aim. When the experts get together, they spend most of their time asking each other questions about aspects of the series upon which they have had no practical experience.

It is time that they and the Legislature had proper guidance from qualified sources; so that a further big muddle should not eventuate from the lack of practical experience. At the same time, the "Electrician" has a tender leaning towards low-temperature carbonization. Why, it probably does not itself know. It refers to the "cautious statements" of the Board of Fuel Research on the subject of introducing coal carbonization as an integral part of electricity generation. But the "cautious statements" are not going to cause our contemporary to relinquish its cherished views. "The sum-total of our knowledge," it adds, "is sufficiently stimulating; and we may hope that, in the final result, low-temperature carbonization will show itself to be a means of obtaining the cheap power that is so important in this country." Why so hope? Why not high-temperature carbonization? Why not interlinking with an industry that is established, and has the power, through diverse means of disposing of its products, of making the best possible value from them per ton of coal carbonized? The "Electrician" stopped just where we should have liked it to go on, and tell us why its hope rests on low-temperature carbonization, when men of such scientific standing and discernment as the members of the Board of Fuel Research are not satisfied as to the trustworthiness, from scientific and economic standpoints, or the information available. Moreover, as was pointed out in our editorial columns last week, the duty of the Board is to enter upon this work of fuel research as a matter of national economy, and not for the benefit of any single industry. Their work is to be constructive and not destructive, and is to be pursued in a broad-minded and not a narrow-minded spirit. There are some

electrical men who, from these points of view alone, would be disqualified from taking part in the work of the Board.

The Cold Weather and Electric Fires.

Winter is beginning to exert itself, and the atmospheric temperature has recently fallen considerably. Fires are now on most days essential to one's comfort. But householders are under the regulations of the Coal Controller, and the worse conditions of shortage in coal merchants' yards, and of labour to handle and deliver coal. The gas undertakings, too, are not pressing householders to fit up more gas-consuming appliances. More than sufficient for the day is the business that comes without the seeking. And people everywhere are asking in no unmeasured terms, which are embarrassing with stocks of gas-fires short as well as the men to handle them. We sympathize with the electrical industry, in that they are unable to take advantage of an unprecedented opportunity. The Fates are against them. One contemporary writes that "all the business in electric cooking and heating which was latent before the war has become active, bringing to the great majority of central stations a demand which they are unable to supply." This is tantamount to an admission that before the war people were not wanting electric cooking and heating appliances, but that those who cannot get gas-fires, coal, or coke will put up with electric-fires rather than in these times of fuel supply pressure go without a reserve means of heating. The same contemporary adds that one central station engineer in a small town recently stated that he could have placed hundreds of electric-fires and dozens of electric-cooking outfits, if the station had not already been overloaded above the safety limit. We are not much astonished at this, with the knowledge possessed as to the impossibility of many gas undertakings to overtake the pile of orders awaiting execution. We further read that "manufacturers' stocks of [electric] fires and cookers are by no means exhausted." There are a large number of electrical undertakings in residential areas that have no industrial load. Why the engineers of such stations do not set out to help towards the exhaustion of the stocks of electric fires and cookers rather than allow them to be lying idle at the manufacturers is a mystery, if they have available the requisite fittings and labour. We think the secret is to be found in the fact that there are not many householders who can afford to heat rooms hour by hour with electricity at from 1d. to 2½d. per unit, with the necessity, in an ordinary sized room, of having a fire which is fitted with three or four elements in order to hold its own when the opposing conditions are severe.

"Loosidity."

The "Electrical Times" is extremely pleased with the "Sheffield Daily Telegraph," because it has been opening its columns to (as it chooses to describe him) "an obviously well-informed writer" on the subject of improvements for the city after the war. Our contemporary is gratified that the writer places cheap electricity in the forefront of his programme. The householder can obtain current on the rateable value system; and so he writes: "In the house rated (say) at £100 per annum, the tenant can pay 10 p.ct. on the rateable value £10, and then obtain electricity for lighting, heating, cooking, &c., at ½d. per unit. The more he uses, the cheaper the cost. He can heat his rooms by neat water-radiators, heated by electricity, by turning a switch. He can heat his bath water by turning a switch, clean his carpets by electricity, and apply it also in his greenhouse to stimulate fruit, flowers, or vegetables. At the price, it is cheaper than any other source of heat or power, and saves immensely in labour. For cooking it is ideal, as there are no fumes, no soot, and no dirt." The "Electrical Times" has to admit that these statements are "expressed somewhat loosely from the technical point of view." We agree, and go farther and say that this "obviously well-informed writer" has not only expressed himself somewhat loosely from the technical point of view. but from that of truthfulness. Our contemporary knows perfectly well that to say that electricity at 10 p.ct. on the rateable value *plus* ½d. per unit is cheaper than any other source of heat or power is not a statement that can be held up to view as an example of accuracy. However, such things are regarded as good enough in the electrical mind for consumption by the general public. Though the statements are "expressed somewhat loosely from the technical view point," they "should appeal to the popular reader!" The popular reader has often been misled by "loosidity" of this kind, which in the long-run does not pay.

Range, Price, and Owners' Views.

Ridicule does not stop progress; if it could, the running of motor vehicles on coal gas should have before this succumbed to the fatuous derision of electrical journalists, who liken the temporary flexible gas-containers to our grandmothers' crinolines, or describe them as objects worth laughing at when they reach the "idiotic stage of semi-deflation." Those may laugh loudest who laugh last. The electric vehicle has not been able to do anything to help to relieve the situation in respect of the shortage of, and yet greater demand for, petrol. Gas, as usual, readily and cheaply steps into the breach, which is the cause of the electrical ill-humour. "Electrical Industries" attempts to prognosticate and to strangle hopes. The general trend of opinion seems to be, as our contemporary finds it, that neither with flexible containers nor with steel cylinders carrying compressed gas will a wide radius of action be secured. Again to it it is quite clear that a much longer range per charge must be achieved before coal gas can become anything more than a war expedient. The range will increase with the utilization of compressed gas; and it so happens that the gas-works throughout the country are pretty closely situated, and so are garages. As opposed to range, there is price; and it has been an eye-opener to owners of motor vehicles that gas at 2s. per 1000 c.ft. is equal to petrol at 6d. a gallon, and gas at 3s. to 9d. a gallon. This is something which touches their pockets; and there appears to be "a general trend of opinion" among them that they are not willing to forego the saving offered by gas if flexible gas-containers or compressed-gas cylinders will allow, and of frequent points are provided at which the containers can recuperate. When we find that large users of motor vehicles are talking of establishing their own gas-works if during war time there is any trouble in obtaining gas from the ordinary sources of supply, we are tempted to laugh heartily over peevish electrical criticism and prognostication. Perhaps the electrical critics will deny to owners of motor vehicles any right to decide for themselves as to the mode of operating them.

In Enemy Countries.

People in a position to gauge the internal conditions of enemy countries say they are considerably worse than represented by, so far as is allowed, the public prints that find their way across the frontiers into neutral territory. We have no sympathy to spare for the lands in which devilry in every form is manufactured, and methods of assassination are studied as a science. Coal is short, through causes traceable not only to pressure on the railway systems, but to underfed miners, lack of experience and training, unsatisfactory terms of work, vanishing zeal, and shortage of materials and means of conveyance in and about the mines. A large proportion of the workers at the mines are unskilled men and women drawn from other vocations, and include prisoners of war. The outlook worsens for the people of Germany; and next winter will be an uncomfortable one for them. Rigorous regulations are being vigorously applied so as to ensure economy in light, heat, and power, in order to save coal. This applies to both gas and electricity. Talking of gas, reminds of the retribution to a dozen or so Zeppelins that were sent by the "kultured" people on a mission of slaughter to this country, and that succeeded in killing some thirty civilians (for most part women and children) and maiming upwards of fifty. There was a great waste of gas from the machines of slaughter that were brought down in France, or else sent adrift helplessly over the seas. Intelligence as to the full extent of this disaster appears to have been kept from the good people who applaud all the manufactured in Germany devices for murdering the civilian people of other countries without meeting them on level ground and equal terms. The civilians of those countries will not forget. But this by the way. As said, the Germans are feeling the pinch of war severely—through, among much else, the restrictions in the use of gas and electricity, and the shortage of the supply of fuel. In Austria things are reported to be even worse. It is known that at least five cities there are without electricity owing to the want of coal: and what is worse for the country, but gratifying to the Allies, machinery in these cities that is driven by electrical energy has been reduced to impotence. There is no secret in Austria as to the paralyzing of industry owing to fuel conditions.

A Century of Light.

The last American mail brought to the office a handsomely bound little volume bearing the title "A Century of Light;" and investigation showed it to consist of an address appropriately delivered before the New Century Club of Philadelphia. The author was Mr. Walton Clark; and the date November, 1915. The present volume is the second edition of the address, which has very evidently "fallen upon good ground." The reader is prepared for the comprehensive nature of the address, by Mr. Walton Clark's declaration at the outset of his intention to "string together some few of the thoughts that may come to one who considers the light physical and the light spiritual, and this with no effort to maintain a theory or to avoid an appearance of inconsistency." The earliest recorded attempt to provide gas-works for an American city was made by Dr. Bollman, in Philadelphia, in 1815; but although Philadelphia had the first start towards the first gas-works, Baltimore and New York had gas-works before Philadelphia. From that time to the present day, the progress of the industry is traced; and then, of course, there are the other thoughts, which appeal strongly to the serious minded—and who is not serious minded to-day?

Mr. A. J. Young, of the San Diego Consolidated Gas and Electric Company, has recounted, in the "American Gas Engineering Journal," his experiences in introducing gas to a large camp located fourteen miles from the works, and nine miles from the nearest main, and providing for an eventual consumption of 60,000 c. ft. per hour. After referring to preliminary experiences in obtaining business in smaller camps, which had the effect of satisfying the army authorities as to the numerous advantages of gas as compared with solid fuels, and removing some prejudices on this point, he gives details connected with the laying of a 6-in. high-pressure pipe-line through very rough country. Gas was turned into the camp early in August; and when writing they were cooking for 4000 to 5000 men and within another month would be providing for some thousands more.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

A very well attended Quarterly Meeting—the 179th—of the Institution was held on Saturday afternoon, in the Grand Hotel, Aytoun Street, Manchester, under the presidency of Mr. Walter Whatmough, of Heywood. The two main matters down for consideration were of much interest to the members; and both were well debated.

Minutes of the Last Meeting.

The Hon. Secretary (Mr. G. S. Frith, of Runcorn) read the minutes of the last meeting; and they were approved.

New Members.

The President read out the names of the following new members: Mr. Dugald Currie, of Nelson; Mr. John W. M'Lusky, of Blackburn, and Mr. George F. Twigg, of Castleford.

Scrutineers.

Mr. F. L. Wimhurst (Newcastle-under-Lyme) and Mr. F. G. Shaw (Buxton) were thereafter appointed Scrutineers to examine the ballot papers.

New Office-Bearers.

The Scrutineers subsequently reported that the following officers had been elected:

President.—Mr. J. P. Leather, of Burnley.
Vice-Presidents.—Mr. E. H. Hudson, of Normanton, and Mr. A. E. Mottram, of Ossett.
Hon. Treasurer.—Mr. James Braddock.
Hon. Secretary.—Mr. G. S. Frith, of Runcorn.
Members of Committee.—Mr. R. E. Gibson, of Liverpool; Mr. F. Betley, of Wigan; and Mr. G. W. Fligg, of Dewsbury.
Auditors.—Mr. Charles Potts and Mr. William Hill.

A Cancelled Visit.

The President said that before proceeding with the business on the *agenda*, he would like to say how sorry his Chairman and Committee had been that the members were not able to visit Heywood last September. All the arrangements had been completed; but unfortunately at the last moment the caterer withdrew, and it was impossible to get anyone else in the town or neighbourhood to provide for the entertainment of the members. It was a very great disappointment, because a nice programme had been drawn up. They were to go to the Technical School, have lunch, and then proceed to the gas-works and the water-works. After this the Chairman was going to entertain the visitors at tea in his home. It was thus a great disappointment; but they would be delighted if on some future occasion the members would arrange to visit Heywood.

Representation on the National Gas Council.

The President remarked that another item not on the *agenda* was a letter from the National Gas Council, which had been received since the last meeting of the Institution. It was in the following terms:

> In view of the very important and often urgent matters at present constantly engaging the attention of the Executive Committee of this Council, and the desirability of their being in the closest touch with facts and opinion in all quarters of the country, it has been decided to ask each of the District Associations and Institutions to nominate one representative to be co-opted for the time being by the Executive.
>
> I am therefore instructed to ask your Institution to nominate such a representative at the earliest convenient date, so that he may receive notice of meetings at which his advice and assistance will be welcomed.
>
> (Signed) W. J. Smith, Secretary.

In reply, he wrote Mr. Smith, entirely on his own responsibility, suggesting that it would be far better if the representative of the Institution could have the same right to vote at the meetings as any ordinary member of the Executive. According to Mr. Smith's letter, the representative would be acting in an advisory capacity; but it seemed to him that he should have the same power as was accorded to their representative on the Council of the Institution of Gas Engineers. However, it appeared that the Articles of Association as at present framed would not allow of this being done. So that if the members decided now to appoint a representative, he would be able to attend the meetings only in an advisory capacity. To put the matter in order, he would submit the name of Mr. J. P. Leather for approval as their representative. Mr. Leather was on the Institution Council, and he was a Vice-President of their own Institution. Probably, by co-ordination, the Institution of Gas Engineers and the National Gas Council would hold their meetings at about the same time in London; and so it would be very convenient if Mr. Leather could take up this position.

Mr. S. Meunier (Stockport) said he thought the idea that their representative should be a member of the Institution Council was a very good one; and they could have no one better able to look after their interests than Mr. Leather. He therefore had pleasure in seconding the proposition.

The President said he hoped the representatives of the various Associations throughout the country would endeavour to get the arrangement put upon a permanent basis, so that they would have equal rights with the other members of the Executive.

The motion was then carried.

The Two-and-Sixpence per Ton on Coal.

The President said another item not on the *agenda*, but which he thought they ought to consider, had reference to the 2s. 6d. per ton which had been added to the cost of coal since Sept. 17. He also wrote to the National Gas Council about this; and they were doing their very best to get some redress from the Coal Controller. He had also mentioned the question of arrears of contracts. Coal which had been delivered since the cancellation of contracts ought not to come in under the 2s. 6d. increase. This point, too, was being taken in hand by the National Gas Council. They all knew the difficulties; but if they could, without discussing the subject, pass a resolution supporting the National Gas Council, he thought it might be of help to them. He begged, therefore, to propose that they, as an Institution, support the National Gas Council in their endeavour to secure some amelioration of this increased charge of 2s. 6d. per ton, which had been made retrospective by the Controller.

Mr. J. P. Leather (Burnley), in seconding, said that everybody knew what this matter meant to them. It was very important that some action should be taken.

After some conversational remarks, the resolution was unanimously agreed to.

Some Experiments on "Steaming" in Continuously Operated Vertical Retorts.

Mr. J. E. Blundell (Macclesfield) then read a paper dealing with "Some Experiments on 'Steaming' in Continuously Operated Vertical Retorts." This, with a report of the lengthy discussion to which it gave rise, will be found on pp. 213-20.

Coal Gas for Motor Vehicles.

This was followed by another full discussion, arising on a suggested scheme regarding the filling arrangements for containers of gas-driven motor vehicles, submitted by a Sub-Committee, appointed by the General Committee of the Institution. These suggestions, with some notes of the remarks made by the various speakers at the meeting are given on pp. 222-23.

On the proposition of Mr. H. Townsend (Wakefield), seconded by Mr. Meunier, a hearty vote of thanks was accorded to Mr. Blundell for his paper, and to Mr. W. M. Barrett, of Manchester, for the able assistance afforded by him to the Sub-Committee in drawing-up the recommendations regarding gas-container filling arrangements.

Testimony from Macclesfield.

Alderman Maxwell, the Chairman of the Macclesfield Corporation Gas Committee, called upon by the President, said he had learned much from listening to the proceedings that afternoon. When the Glover-West vertical retort proposition was submitted to them some years ago, they received assurances which had proved absolutely justified. The retorts had, in fact, accomplished more than had been expected of them. He hoped Mr. West would live many years to witness the effects of his excellent plant. They had at Macclesfield been very fortunate in the matter of engineers. They had had three members of the Newbigging family. With a small gas-works like those at Macclesfield, in the nineteen years these gentlemen were with them, they made a profit of over £100,000; and now they had Mr. Blundell, who was second to none, and they also had in Mr. Belton a young man of great value.

Work of the National Physical Laboratory.

Along with the report for the year 1916-17 of the National Physical Laboratory, Teddington, we have received a bulky volume of "Collected Researches"—Vol. XIII., 1916, published by Messrs. Harrison & Sons, of St. Martin's Lane, W.C., at the price of 20s. The matters that are dealt with in these researches cover a wide field; and in the main they are reprinted from the "Transactions" of different scientific societies. One section, however, which is not stated to have so appeared before is a report on tests of fuel oils carried out for the Royal Commission on Oil Fuel. These tests were undertaken with the object of investigating the laws of flow of the oil in drawn steel pipes of varying sizes, with a view to determining how far the pressure difference required to produce a given flow could be calculated from a knowledge of the dimensions of the pipe and the viscosity of the oil. Experiments were made on the flow of four oils in pipes of 3, 4, and 5 in. diameter. These are described in Part I. of the report; and Part II. deals with the determinations of the densities and viscosities of the oils used at various temperatures, and the measurement of their flash-points. Similar measurements are also given on three additional oils. It further includes determinations of the same quantities for mixtures of the various oils, with the results of some observations on the permanence of the mixtures. Part I. is the work of Mr. J. R. Pannell, and Part II. of Mr. W. F. Higgins. As to the report on the year's work of the Laboratory, it is stated that high-temperature tests of pyrometers have become of increasing importance, owing to war requirements; and the Laboratory standards for dealing with this work have been greatly improved and extended. Two optical pyrometers of the polarizing type have been obtained and calibrated to 1600° C. by comparison with standard thermocouples. Valuable work has been done in the improvement of furnaces for work at high temperatures. Interesting results have been obtained in an investigation into the thermal conductivities of refractory materials; and the thermo-physical properties of such materials are being generally studied. Special investigations carried out have included a series of fatigue tests on compressed gas cylinders.

The discovery of monazite in Mysore, which was made some time ago, when high hopes were held with regard to the future, has, the "Engineer" understands, proved very disappointing.

EXPERIMENTS ON "STEAMING" IN CONTINUOUSLY OPERATED VERTICAL RETORTS.

By J. E. Blundell, of Macclesfield.

[A Paper read before the Manchester District Institution of Gas Engineers, Oct. 27.]

Owing to the increased cost and shortage of coal and labour, those responsible for the conduct of the gas industry are faced with some difficulty in maintaining an adequate supply of gas to the consumers, and in endeavouring to keep the selling price as low as possible. To meet these conditions, gas engineers are seeking to increase the output from their plant, while maintaining the statutory calorific standard.

Having carried out some experiments, with this object in view, at the Macclesfield Corporation Gas-Works, I am now afforded the opportunity of placing before members of the Institution the details of the researches that have been made. The carbonizing plant at Macclesfield consists of an installation of Glover-West vertical retorts, having a normal capacity of one million cubic feet of coal gas per twenty-four hours. The productive capacity of this plant has been increased at least 20 p.ct. by passing steam into the charge in the retort—thus generating water gas *in situ*. In addition, there is an increased yield of tar and ammoniacal liquor.

Members will be aware that, in the Dessau, or intermittent, system of vertical retorts, it is usual to inject steam for the last one or two hours of the period of distillation, although more than one investigator has shown that it is at least doubtful whether this is an economical practice. It has generally been shown that an equal volume of mixed gas could be as cheaply made in two separate plants—viz., vertical retorts and a water-gas plant.

The Young and Glover patent of 1905 states that steam may be admitted at the base of continuously operated retorts, with the view of diluting the richer coal gas; but progress in this direction has been somewhat retarded by the candle-power standard which has been in force up to recent years. The substitution of calorific value for the former candle-power standard has, however, paved the way for the development of gas production by this means. It has been a debatable point as to whether the production of water gas in continuously operated vertical retorts could be made an economical process. Most engineers are in favour of the system of making water gas in a separate generator, and then diluting the coal gas with it.

The continuous system of gas manufacture in vertical retorts appealed to me, however, as being favourable to the production of water gas *in situ*; and this process has been developed at Macclesfield since the adoption of tar-washing. There is an essential difference between steaming as practised in the Dessau system and that applied to the continuous system. In the former, carbonization proper is completed before steaming, and the retort is used simply as a water-gas generator. In the latter, carbonizing temperatures are maintained during steaming, and the manufacture of water gas is carried on without interruption of the ordinary process of dry distillation. I am aware that experiments on the admission of steam to continuously operated vertical retorts have been made; but no published results are available, as far as I know, giving analyses of the gas obtained or any detailed indication of the method of operating the retort-settings to obtain the desired results.

Theoretical Considerations.

I now wish to place before you the theoretical ideas on which these experiments were based, and to give you the detailed results obtained in actual working during the past five months. When considering the possibility of increasing the output of the plant, it was thought that a considerable quantity of steam could, with advantage, be admitted to the charge in a continuously operated vertical retort. The late Professor Vivian B. Lewes, in his book on "The Carbonization of Coal," refers to his researches in the dilution of coal gas with blue water gas, and states that, by an admixture of 40 p.ct. of blue water gas, he obtained an increased production in candle-feet of 25 p.ct. These experiments were with gas made in horizontal and inclined retorts, and with water gas produced in a separate generator. The results indicated that this method of working was unreliable. The quality of the gas was subject to great fluctuations, and the process did not prove to be a profitable one. It should be specially noted that Prof. Lewes's experiments were carried out in intermittently worked retorts.

With continuously operated vertical retorts, in which the quality of the gas made is constant, it appeared that, with a regulated supply of steam, the difficulties experienced by Prof. Lewes, as regards the fluctuations of the quality of gas produced, would be overcome. Moreover, the system of introducing water gas to the vertical retorts from an outside generator would be attended with certain inconveniences. The necessary quantity of blue water gas would have to be stored at the necessary pressure to supply the retorts for a period of (say) twenty-four hours; and the introduction of water gas at the bottom of the retort, with the possibility of leakage, would give rise to the risk of gassing the attendants and the danger of explosion under the setting. These inconveniences would be obviated by the proposed method of generating water gas *in situ*. The installation was already provided with means for admitting a moderate amount of steam to the coke-chambers at the base of the retorts for the purpose of filling the coke-chamber before discharging, though no considerable proportion of water gas was made in this way. But it was easy to use this existing apparatus for a constant and increased supply of steam, passing up into the incandescent coke in the retort and being converted into water gas, which would dilute the richer coal gas and probably have other advantages.

The question as to whether, with continuous steaming, there would be a large increase in the consumption of fuel for heating the retorts, and whether it would be possible to maintain the required temperature in the setting, could not be settled theoretically, as it was not known to what extent it would be possible to carry the dilution. This problem was therefore left to be solved by actual experiments. The reactions anticipated, and on which success depended, were as follows: In the ordinary system of working the retorts, it was customary to concentrate the highest temperatures in the upper combustion chambers, in order to carbonize the coal quickly and surround it with a jacket of coke; so that the contraction of the coke, on further heating, would facilitate the descent of the charge through the retort. The idea was that this condition of things might have to be altered, because, under the conditions proposed, the primary carbonization of the coal would be accomplished, not only by the heat at the portion of the retort in which the coal was at the moment situated, but also by the stream of highly superheated water gas from the lower portion of the retort.

For the satisfactory production of the water gas, it would be necessary to increase considerably the temperature of the lower combustion chambers, because, if this were not done, the complete water gas reaction would not take place, and there would be a considerable increase of CO_2 in the gas. But it was thought that, if the lower combustion chambers were kept at a sufficiently high temperature—say, about 1350° C.—then the coke and scurf in the retort would be hot enough to complete the water gas reaction, so that there would not be any appreciable increase of CO_2 in the resultant gas. Under the ordinary conditions, gas from the lower portions of the core of partially carbonized coal has to travel through a body of incandescent coke and, coming into contact with the heated sides of the retort, it is degraded; the hydrocarbons being split-up into free hydrogen and carbon—the latter being deposited as scurf.

It was anticipated that the maintenance of a steam pressure in the extractor chamber, and in the lower portion of the retort, sufficient to overcome the back-pressure thrown by the charge of coal in the upper portion of the retort, would result in the passing of the steam into the incandescent coke in the lower portion of the retort, where it would be converted into water gas, which would subsequently travel upwards and carry with it the last traces of coal gas from the bottom end of the retort. The result of this mixing of the gases would be a less degradation of the hydrocarbons of the coal gas. It was thought, also, that the stream of superheated water gas from the lower portion of the retort, passing through the semi-carbonized coal, would wash-out tar vapours, which would otherwise remain in the coal until it had travelled further down the retort where they would undergo destructive distillation; and it was probable that the action of water gas at this point would be similar to that of open steam as used in tar distillation. The hydrogen of the blue water gas would be at a sufficient temperature, and would be in contact with the body of coke in the retort for a sufficient time, for ammonia to be produced in accordance with Tervet's reaction.

Practical Application.

When putting the above theories into practice, the first thing was to alter the heating arrangements. This necessitated a complete readjustment of the waste-gas and secondary-air dampers, and it was also found possible, and to be a great advantage, to work with the minimum amount of chimney draught. In fact, the top combustion chambers were actually worked under a slight pressure. With a pressure in these top chambers, the temperature on the combustion side of the retort reached 1300° C. The rate of travel of the products of combustion through the chambers was retarded. Consequently, more heat was extracted from the gases in the chambers; the outlet temperatures being thereby lower than they otherwise would have been.

A reference to the system of heating in the Glover-West settings will make this position clearer. As shown in the accompanying diagram (p. 214) six superposed combustion chambers are separately supplied with fuel gas and secondary air; the waste gases from these chambers enter a common vertical up-take flue which leads to two upper chambers through which the waste gases circulate before passing to the chimney. Below the combustion chambers there are two regenerator chambers, through which the secondary air passes, taking heat from the outgoing coke.

The temperature in the lower combustion chambers was raised to between 1300° and 1400° C. Details of these temperatures are given on the accompanying diagram. The same diagram gives the temperatures under the ordinary conditions of working. These show very clearly the alterations which have been made in this respect. It was found necessary, in order that the body of the coke in the retort should become sufficiently heated for the water gas reaction to take place satisfactorily, to reduce the speed

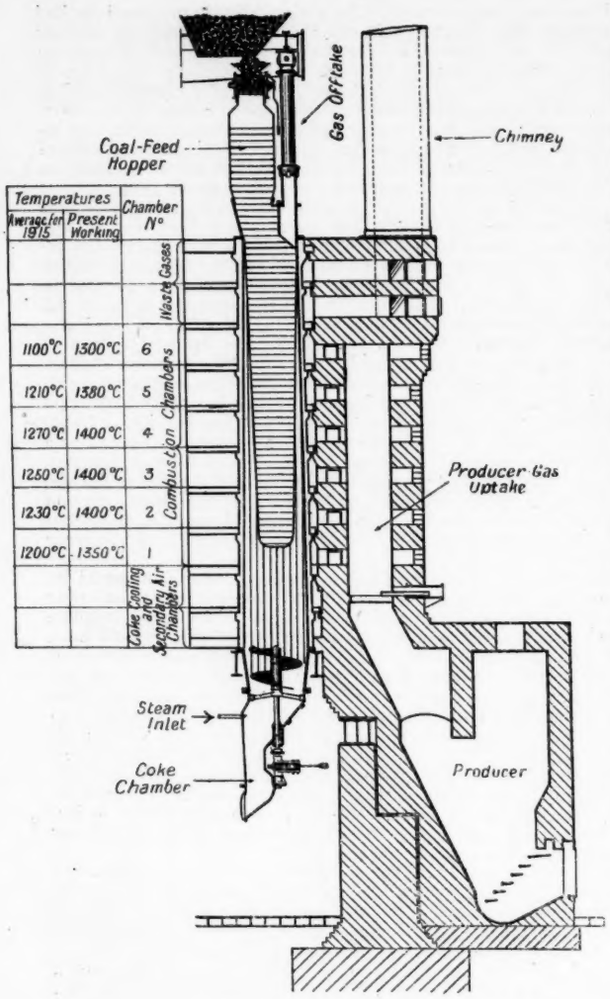


Diagram Illustrating the System of Heating the Glover-West Retorts at the Macclesfield Gas-Works.

of extraction of the coke by about 10 p.ct. When this was done, it was found that the production of blue water gas took place satisfactorily, and to an extent which allowed the gas to be diluted until it had the required calorific value.

In connection with the maintenance of heats required in this process, special attention has to be paid to the regular and systematic cleaning of dampers and flues. Particular attention must be paid to the regular cleaning of chimney dampers and waste-gas dampers of individual combustion chambers. If this is not done at least once a month, the heats will drop to a sufficient extent to increase considerably the CO_2 content of the gas. On one occasion, the CO_2 content of the gas had risen to 4·4 per cent., and investigation showed that the combustion chambers Nos. 2, 3, and 4 had cooled considerably, owing to an accumulation of dust in the flues. After the waste-gas dampers had been thoroughly cleaned, and the chambers had again attained the proper temperature, the CO_2 content fell to 2·8 p.ct. It was also noted that when the CO_2 stood at 4·4 p.ct. the CO content was only 9 6 p.ct., and the nitrogen content was 8·64 p.ct. When the CO_2 content fell to 2·8 p.ct., the CO rose to 11 p.ct. and the nitrogen fell to 8·1 p.ct. Thus:

—	Analysis with Temperature Low.	Analysis after Dampers were Cleaned.
	P.Ct.	P.Ct.
CO_2	4·40	2·8
CO	9·60	11·0
N_2	8·64	8·1

In the usual method of working, it had been the custom, as far as possible, to work with a slight pressure on the outlet of the retorts in order to avoid drawing in air and furnace gases. During these experiments, it was found that the make of gas per retort was considerably increased, and, as a consequence of this, and of the fact that the outlet valves and pipes could not be correspondingly increased in area, it was found that, in order to work with a level gauge at the top of the retort, it was necessary to maintain a pull of ½-10th to ½-10th on the inlet of the retort-house governor.

The temperature of the gas in the off-take pipe just above the top mouthpiece of the retort was observed to be 200° C.; in the gas-collecting main it was 95° C.; and at the outlet of the retort-house governor, placed at the end of the retort-bench, it was 70° C. Experiments with the actual steaming were extremely interesting. Several classes of coal were carbonized, and the results obtained, with the different classes of coal with the same pressures of steam, were widely divergent. Observations showed that these results were largely dependent upon the character of the coke. It was found that some cokes were acted upon much more rapidly, or gave easier passage to the steam, than others, with the result that, working with a given pressure of steam, a much larger percentage of blue water gas was formed with some classes of coal than with others. Or, to put it in another way, to obtain a gas with a desired percentage of CO, a lower pressure of steam was required when working with some coals than with others. This steam pressure had to be determined by experiment, and by constantly testing the composition of the resultant gas. A hard, dense coke requires a greater pressure of steam than a more open and friable one. This observation coincides with known experience in connection with producer-gas plants.

For example, when working two beds of retorts with one class of coal and steam at 10 lbs. pressure, the gas made amounted to as much as 17,500 c.ft. per ton of a gross calorific value of 488 therms. The CO_2 was only 2·4 p.ct., while the CO was 16 p.ct. On the other hand, when using a different class of coal under the same conditions as to heats and steam pressure, the make per ton was 15,000 c.ft. with a gross calorific value of 511·5 therms; the CO_2 content being 2·2 p.ct., while the CO was only 12·4 p.ct. These results emphasize the point previously mentioned—namely, that when dealing with different coals it is very necessary to keep a close watch on the composition of the gas and to regulate the steam supply accordingly.

Steam from Lancashire boilers working at 100 lbs. pressure per square inch is supplied through a reducing valve to the vertical retorts; the pressure being reduced at the settings to that required on the plant. The low-pressure steam is admitted to the coke-chamber through a nozzle of ¼-in. bore.

Results.

The results obtained under the ordinary system of working compared with those obtained by the new method with steaming are shown in the following table:

—	Average for Year Ended Mar. 31, 1915	Test on June 4, 1917.	Test on Aug. 13, 1917.	
		Average for Five Months Ended Aug. 31, 1917.		
Coals carbonized: Source of supply	Yorkshire coalfields.	Yorkshire, Derbyshire, and Staffordshire coalfields.		
Proximate analysis:	P. Ct.	P. Ct.		
Volatile matter	34·40	36·4		
Ash	7·74	8·5		
Sulphur	2·50	2·46		
Nitrogen	1·50	1·5		
Gas made in cubic feet per ton at N.T.P.	12,049	15,500	15,477	Remarks: The average make of gas per ton for the three months to Aug. 31 was 15,358 c.ft.
Calorific value, gross.	530 therms	510 therms	508 therms	
Analysis of gas:				
CO_2	2·4	3·0	2·0	
C_nH_m	2·4	2·4	2·2	
O_2	*Nil*	*Nil*	*Nil*	
CO	9·8	10·6	13·6	
CH_4	23·9	21·3	24·1	
H_2	53·2	54·4	49·65	
N_2 (By difference)	8·3*	8·3*	8·45*	2 p.ct. of air is admitted to the purifiers for revivification *in situ*
	100·0	100·0	100·0	
Total incombustibles.	10·7	11·3	10·45	
		Average for Three Months Ended Aug. 31 1917.		
Coke made per ton of coal	13·6 cwt.	13·36 cwt.		

These figures are comparative only—see next paragraph.

Incombustibles.

The foregoing table is based on tests taken quickly for the purpose of comparison and adjustment of the steaming operations. Consequently, the nitrogen content, forming the bulk of the incombustibles, appears to be much higher than was revealed by a more lengthy test. On Sept. 18, 1917, when the make per ton was 15,900 c.ft., and a day's output of 16 retorts was 656,000 c.ft., a sample of the gas was collected in a small holder during the period of twenty-four hours. A portion of this sample was tested

in our own laboratory, and other portions were sent to independent chemists, who returned the following analysis:

	P.Ct. by Volume.
CO_2	2·90
C_nH_m	2·20
O_2	0·20
CO	13·90
CH_4	22·80
H_2	53·23
N_2 (by difference)	4·77
	100·00
Total incombustibles	7·87

The calorific value calculated from the above analysis is 495·1 therms per cubic foot; but the average gross calorific value over a number of actual tests taken during the day was found to be 515 therms.

Coke.

The calorific value of the coke, tested in the Roland-Wild bomb calorimeter, was 12,700 therms per pound. The coke was dry, hard, and had a clean, grey appearance.

Ammoniacal Liquor.

Ammoniacal Liquor Made.	During the Year Ended March 31, 1915.	During Three Months, Ended Aug. 31, 1917, Under New Method of Working.
10 oz. liquor per ton of coal	25·3 gallons	32·68 gallons

Tar.

The yield of tar is shown in the following tables:

	During the Year ended March 31, 1915.	During three Months ended Aug. 31, 1917, under New Method of Working
Tar made per ton of coal	10·9 gallons	16·61 gallons

Analysis of Tar made under the New Method of Working with Steaming.

Specific gravity 1·08

207 gallons per ton

Crude Products.	Gallons per Ton of Tar.	Per Cent. by Weight.
Ammoniacal liquor at 2·17 p.ct. NH_3	12·69	5·66
Crude benzol, sp. gr. ·873	11·23	4·38
Middle oil, sp. gr. ·980 (up to 270° C.)	60·00	26·25
Heavy creosotes, sp. gr. 1·047	45·50	21·26
Pitch, medium soft		41·00
Loss		1·45
		100·00
Products after Further Treatment.		
90's benzol	1·80	0·71
90's toluol	0·95	0·37
Solvent naphtha	4·04	1·57
Tar acids	20·65	9 68
Crude pyridine	2·36	1·09
Total creosote	84·18	37·58
Pitch		41·00
Ammonia water and loss		8·00
		100·00

The tar contained 4·58 p.ct. of free carbon.

For the purpose of comparison, as it was impossible to test a sample of the tars made in 1915, a sample of tar was obtained from a works where a Glover-West vertical retort plant is in operation under the ordinary conditions and without steaming. The output of tar at these works was about 13 gallons per ton.

Analysis of Tar Made without Steaming.

Specific gravity 1·087

206 gallons per ton

Crude Products.	Gallons per Ton of Tar.	Per Cent. by Weight.
Ammoniacal liquor at 2·6 p.ct. NH_3	9·21	4·11
Crude benzol, sp. gr. ·860	7·30	2·80
Middle oil, sp. gr. ·968 (to 270° C.)	57·86	25 00
Heavy creosote, sp. gr. 1·03	40·92	18·82
Pitch, medium soft		47·75
Loss		1·52
		100·00
Products after Further Treatment.		
90's benzol	1·17	0·46
90's toluol	0·50	0·19
Solvent naphtha	2·81	1·09
Tar acids	18·87	8·84
Crude pyridine	2·70	1·25
Total creosote	77·10	33·92
Pitch		47·75
		93·50
Ammonia water and loss		6·50
		100·00

The tar contained 5·20 p.ct. of free carbon.

In order further to establish the value of the tar obtained at Macclesfield with steaming, a sample was sent to Mr. Harold Moore, M.Sc., F.C.S.; and he kindly analyzed it, from his point of view, with the following result. The sample sent to Mr. Moore was taken under similar conditions to those represented by the test already given:

Laboratory Report—Macclesfield Vertical Retort Tar.

Description: Vertical Retort Tar from Macclesfield Gas-Works with Steaming.

Specific gravity, 1·071 at 20° C.

Engler Flask Distillation:

Drop	at 150° C.
20 p.ct.	at 200° C.
40 p.ct.	at 250° C.
53 p.ct.	at 300° C.
78 p.ct.	at 350° C.

Residue, hard pitch.

Gross calorific value, 8526 calories, 15,347 therms
Net ,, ,, 8168 ,, 14,702 ,,

Viscosity (Redwood), 166·0 units at 70° Fahr. } Standard in rape oil = 100 units at 60° Fahr.
39·2 ,, ,, 100° ,,
7·6 ,, ,, 200° ,,

Closed flash point (Gray)	104° Fahr.
Tar acids	11·6 p.ct. } Estimated in distillates from Engler flask distillation.
Tar bases	None
Water	3·2 p.ct.
Carbon	85·44 p.ct.
Hydrogen	7·4 p.ct.
Oxygen and nitrogen	2·89 p.ct.
Sulphur	0·88 p.ct.
Ash	0·19 p.ct.
Coke	10·30 p.ct.
Free carbon	3·4 p.ct.

(Signed) H. Moore.

Effect of Steaming on the Retorts.

Under ordinary working conditions, it is necessary to let-down the retorts for the removal of scurf at intervals of about four weeks. When the retorts were let-down for scurfing after the same period of working with the admission of steam, it was found that the scurf was nowhere as much as half as thick as under ordinary working, and there was very little indeed at the bottom end of the retort. The character of the scurf is altered, too; for, whereas under ordinary conditions the scurf is hard and solid, under the new conditions it is more friable and quite porous. It is evident that the scurf is acted upon directly by the steam, and provides some of the carbon necessary for the conversion of the CO_2 to CO in the water-gas reaction.

With regard to the idea that steaming would have a very deleterious effect on the material of the retort, we can state that this has not so far been borne out by our experience. In considering this question, it must be remembered that the conditions obtaining in a vertical retort are very different from those in a water-gas generator. In the latter, steam at ordinary temperatures is blown in great volumes at high speed into a chamber which has a considerably higher temperature at the point of entry than obtains in the interior of the vertical retort; and during the run the temperature at this point drops very considerably. This temperature is again very rapidly increased during the period of blow. On the other hand, in a continuously operated vertical retort, before the steam reaches the point in the retort in which water gas is first generated, it has already become superheated to a temperature of 500° to 600° C. by its passage through the hot coke in the regenerator chambers. Also the steam nowhere impinges violently upon the hot sides of the retort—it simply flows through the coke in a slow, steady stream, distributed over the whole area of the retort, and, owing to the continuity of the process, there is no alteration in the temperatures of any one portion of the retort.

Fuel.

Under the heading "Theoretical Considerations," it was mentioned that we had no conception at the outset as to what effect this additional steaming would have on the consumption of fuel in the producers. But several careful tests of fuel consumption in the producers have shown that the figure is very reasonable—one test giving the consumption of coke as 11·5 lbs. per 100 lbs. of coal carbonized, another giving 10·95 lbs.

No doubt more fuel is consumed when producing water gas. Comparisons, however, are difficult to make, since there is always a greater tendency to economy under test than under normal conditions. Investigations of results obtained in intermittent verticals appear to show that about 1 lb. more coke is consumed in the producer per 100 lbs. of coal carbonized when steaming to the extent of 14 p.ct. of water gas; and probably this estimate is nearly correct for the steaming of continuous retorts.

The following table shows the quantity of coke probably converted into water gas in the retorts:

—	Average for 1915.	Test of June, 1917.	Test of Aug., 1917.	Mean of 1917 Tests.	Difference between mean 1917 and 1915.
Total gas made per ton. c.ft. at N.T.P.	12,049	15,500	15,477	15,489	3440
Analysis.	C.ft.	C.ft.	C.ft.	C.ft.	C.ft.
CO_2 . .	2·4 p.ct. = 289	3·0 p.ct. = 465	2·0 p.ct. = 310	388	+ 99
$C_n H_m$ . .	2·4 p.ct. = 289	2·4 p.ct. = 372	2·2 p.ct. = 340	356	+ 67
O_2 . . .	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*
CO . . .	9 8 p.ct. = 1181	10·6 p.ct. = 1643	13·6 p.ct. = 2105	1874	+ 693
CH_4. . .	23·9 p.ct. = 2880	21·3 p.ct. = 3302	24·1 p.ct. = 3730	3516	+ 636
H_2 . . .	53·2 p.ct. = 6410	54·4 p.ct. = 8432	49·7 p.ct. = 7692	8062	+1652
N_2 . . . (by difference)	8·3 p.ct = 1000	8·3 p.ct. = 1286	8·4 p.ct. = 1300	1293	+ 292
Totals . .	12,049	15,500	15,477	15,489	+3439

Weight of carbon in 99 c.ft. $CO_2 = \frac{12}{44} \times 0{\cdot}1165 \times 99 = 3{\cdot}1$ lbs.

" " 693 " $CO = \frac{12}{28} \times 0{\cdot}0741 \times 693 = 22{\cdot}0$ lbs.

25·1 lbs.

That is, about 25 lbs. of carbon per ton of coal carbonized is converted into water gas.

Assuming that 1 lb. of carbon, in decomposing 1½ lbs. of steam to make water gas, uses up 4250 therms, it follows that 25 lbs. of carbon requires the addition of (4250 × 25) = 106,250 therms to effect the water-gas reaction. With (say) a calorific value of 14,000 therms per pound, this means that theoretically $\frac{106250}{14000}$ = 7·6 lbs. of additional fuel are required to be consumed in the producer per ton of coal carbonized. If the thermal efficiency of the setting is taken at 30 p.ct., the actual additional fuel consumption would be 25·3 lbs.—a figure which compares closely with the estimated 1 p.ct. referred to above.

The quantity of steam required to convert 25 lbs. of carbon is 37·5 lbs., theoretically. To generate this steam in a good Lancashire boiler about 4 lbs. of fuel will be consumed. Experiments, however, seem to show that the greater portion of the steam supplied to the coke-chambers is lost in condensation. In an installation with steam supplied from boilers in the usual way, as much as six times the theoretical requirements should be allowed for. Therefore, the fuel consumption for the generation of steam should be reckoned at 6 × 4 = 24 lbs. of coke per ton of coal carbonized.

The loss, therefore, in coke for sale per ton of coal carbonized is made up as follows:

	Lbs.
(1) Carbon converted into water gas in the retort	= 25
(2) Extra fuel supply to the producer to effect the water-gas reaction	= 25
(3) Fuel supply to boilers to generate steam	= 24
Total	74

This estimate is certainly on the high side; and it appears probable that in practice the coke sold per ton of coal carbonized will be reduced by about ½ cwt. With regard to the first item, it is probable that a portion of this carbon is provided by the scurf, which, as before mentioned, is observed to be appreciably less in quantity when the retorts are worked with steam. The third item (fuel required to generate steam) will no doubt disappear in future developments, when steam will be generated by the waste heat from the settings—a suggestion which is, of course, by no means new.

The practice of stating fuel consumption, in terms of pounds of fuel per 100 lbs. of coal carbonized, is open to question. A small output per ton of coal is often credited with a low fuel consumption, whereas a comparatively slight increase in the fuel consumed might result in a greatly increased output of valuable products. Some more comprehensive method of ascertaining the value of fuel economy in comparison with the results obtained would be welcome. Probably a statement in terms of energy expended in the form of heat to obtain a given output of available energy in the gas, coke, and other products would be more in accordance with scientific ideas.

The following table shows the amount and distribution of the heat contained in one ton of coal carbonized compared with that available in the products for sale:

Table Showing Thermal Efficiency.

	Therms.	Therms.
Coal, 1 ton at 13,600 therms per lb.		30,464,000
Gas, 15,358 c.ft. at 510 therms	7,832,580	
Coke, 13·36 cwt. at 12,700 therms per lb. . . .	19,003,260	
Tar, 16·61 gallons, specific gravity 1·071 at 15,347 therms per lb.	2,730,125	
Total heat in products. . . .	29,565,965	
Less, Fuel 12 lbs. per 100 lbs. of coal carbonized, including 1 lb. for boiler fuel, 268·8 lbs. at 12,700 therms.	3,413,760	
Net heat available in products obtained from 1 ton of coal		26,152,205

Thermal Efficiency $\frac{26,152,205}{30,464,000} = 85{\cdot}84$ p.ct.

The following table shows the effect of steaming from the financial point of view:

Table Showing the Saving Effected by Steaming on an Annual Output of 200 Millions.

	Without Steaming.		With Steaming.	
		£ s. d.		£ s. d.
Gas made per ton of coal carbonized	12,049 c.ft.		15,358 c.ft.	
Coal carbonized at £1 per ton .	16,599 tons	16,599 0 0	13,022 tons	13,022 0 0
Residuals—				
Coke saleable, per ton of coal at 23s. 4d. per ton . . .	11 cwt. 9129 tons	10,650 10 0	10·75 cwt. 6999 tons	8,165 10 0
Tar, per ton of coal at £1 per ton . . .	10·9 gallons 880 tons	880 0 0	16·61 gallons 1040 tons	1,040 0 0
Amm. liquor—10 oz.; per ton of coal at 9s. 6d. per ton . . .	25·3 gallons 1926 tons	914 17 0	32·68 gallons 1952 tons	927 4 0
Total residuals		12,445 7 0		10,132 14 0
Net cost of coal		4,153 13 0		2, 889 6 0

Saving in cost of coal, 30 p.ct.
Saving in weight of coal, 3577 tons.

PRODUCERS.

In connection with the maintenance of regular heats, it would appear that the usual method of working the producers, with closed doors and a limited supply of primary air, is not the most advantageous. I am indebted to Mr. John West for the method at present in use, in which the amount of air drawn through the producers is regulated by means of the dampers on the outlet flues. Working in this way, the producer clinkering doors are open wide, or taken off, and the main producer gas dampers on the outlet of the producers at the base of the producer gas uptake flues leading to the combustion chambers, are regulated to allow just the necessary amount of producer gas to be drawn through. The chief advantages derived from this method of working are:

1.—A steady supply of producer gas is maintained throughout the whole of the twenty-four hours; the operation of cleaning the fires making no appreciable difference in the volume of air drawn through the producers. Under the old method, an amount of producer gas at a low temperature, largely in excess of the volumes required for heating the settings, was drawn through whenever the doors were opened for cleaning the fire; this excess of gas frequently burning at the top of the chimney.

2.—The heats in the setting are constant.

3.—Less coke is used, since there is no waste due to the rush of air through the producer during cleaning operations.

4.—The temperature of the producers does not become excessive at any time and less clinker is formed.

5.—Owing to the checking of the main producer-gas dampers, a slight pressure is maintained in the producer, so that no air is drawn in round the firing-door lid.

The following is an analysis of the producer gas:

	P.Ct. by Volume.		P.Ct. by Volume.
CO_2	4·00	CH_4	0·84
O_2	*Nil.*	H_2	2·40
CO	25·00	N_2	67·76

DIMENSION OF THE "UNIT."

The question of the size of the "unit"—that is to say, of the capacity of the retort, or number of retorts—which can be readily heated-up or let-down in accordance with the demand for gas, becomes of considerable importance, particularly in works of small or medium size. In the first place, there is the question of the flexibility of the plant, and, secondly, there is the expenditure of fuel for the maintenance of heats in the stand-by plant—the latter item being more evident when only a small portion of the plant is "in commission."

The capacity of one vertical retort is generally equal to that of

a whole setting of horizontal retorts of the old type, common in small works. It is therefore evident that, when only working one setting of eight retorts, divided into two units of four retorts, a stand-by of another unit of four retorts entails an expenditure of fuel not much less than that consumed in the setting in action. This difficulty has been met, in some installations, by the provision of a special stand-by setting in small units; and there is no reason why these units should not be as low as one or two retorts according to the size of the plant. To make this provision as economical as possible, too many retorts should not be served by one producer.

The consumption of fuel in the producers at Macclesfield would have been appreciably less, particularly in the summer months, if we had had such a convenient stand-by setting. Consequently, more coke would have been available for sale. It is therefore worthy of serious consideration by those contemplating the installation of vertical retorts, especially in small and medium-sized works, whether they should not instal their plant in small units, as the extra initial cost will subsequently be returned by economy in fuel consumption.

Conclusion.

In conclusion, I trust that this paper will be found to contain practical information of some value to those who are faced with the problem (as most of us are) of increasing the output of the existing plants under the present difficult circumstances due to the war—difficulties which may remain with us for some considerable time after the conclusion of peace.

DISCUSSION.

The President (Mr. W. Whatmough, of Heywood) said they must all consider that Mr. Blundell had been very fortunate, in these days of high pressure and reduced staffs, to be able to bring forward such an excellent paper as he had done. They were delighted to have their old friend and veteran in the gas profession, Mr. West, with them; and he would call upon him to open the discussion.

Mr. John West (Southport) said that, knowing Mr. Blundell so well, he certainly expected something good from him; but he did not expect so much good. When the author was engaged at Southport, he formed a very high opinion of his talents; and when, years ago, he was making some experiments at St. Helens with vertical retorts in their early stages, he wanted a practical chemist to carry out other experiments to check his own. It struck him that Mr. Blundell was the very man for the work, if he could get him; and to this Mr. John Bond and his Chairman willingly assented. Therefore Mr. Blundell had had an early opportunity of acquiring knowledge on the subject; and his were the first experiments that were published. After this, vertical retorts were erected at Southport; and he had further large experience in working them there. Time went on, and a new Manager was required for Macclesfield, who could efficiently work vertical retorts; and he strongly recommended Mr. Blundell. He was therefore delighted to find he had turned out satisfactorily. In the paper, the author stated that he got independent chemists to analyze the gas, and they gave 7·87 p.ct. by volume of total incombustibles. This was a very important analysis, especially as regarded the nitrogen content; and he therefore asked Mr. Blundell the names of the chemists. He was told privately, and they were very eminent chemists; but the author could not mention their names in the paper without permission. It was a splendid analysis; and he (the speaker) could confirm it. Mr. Blundell had increased his ammoniacal liquor very much, and also the tar. He had mentioned three months in the paper. How did he measure up his tar and liquor? He (Mr. West) in his younger days knew a little bit about the measuring of wells and making calculations. [Laughter.] Was it done by accurate measurement, or was it based on actual sales, or what? It was a remarkable fact that he had got this excess of tar over former results. In figures which he himself would shortly be submitting in London, he would confirm this and other matters stated in the paper. There was a very clever analysis included by the author which was made by Mr. Harold Moore. He did not know Mr. Moore; but it seemed to him a good table, and something he had not come across before. It should prove of material benefit. He knew Mr. Blundell's plant had been up about five years; but he would like to hear how long he had been actually steaming "full tilt." It was an important matter, because some little time ago he himself had been making some experiments, and one of his friends said: "Do not go on with that project. You will soon have your retorts all run down. I am accustomed to making blue water gas in an ordinary generator; and after only a few months it eats into the material very considerably." It was therefore important that they should have information on the subject of wear and tear. Of course, some of them had been working on this for a long time. He had a friend from Scotland who had been at it for two-and-a-half years, producing marvellous results. Had Mr. Blundell continued to maintain his results? The author was in a much better position than he himself had been in comparing what the cost would be for coke and steam as against an ordinary generator, because he (Mr. West) had not had a water gas plant to work upon. Could he give them this in £ s. d.? The table of saving effected by steaming was the *crux* of the whole business, because these things were of no use unless one could reduce them to £ s. d. The author had done this; and he was to be congratulated on the splendid results he had achieved. He hoped the Corporation would look after Mr. Blundell. [Laughter.] He meant what he said, because some of his friends were not being looked after at the present time. They should pay them and look after them as he (the speaker) paid his own servants. He did not permit them to ask for an advance; he gave it to them without. He was glad to see Mr. Blundell had mentioned his assistant, Mr. F. W. J. Belton, who was a son of one of the old members of the Institution, and one of his own former pupils. He was doing very good work. A good assistant was necessary, because a man could not do all this work himself.

Mr. William Buckley (Droylsden, Manchester), after remarking that he had had some little experience of vertical retorts, said they would remember a paper entitled "The Scientific Carbonization of Coal." He thought the paper they had just heard read proved conclusively that scientific control in the retort-house had had results which were well worth the trouble and the cost. ["Hear, hear."] Personally, he dared not work at the very high heats Mr. Blundell did. He would like to ask whether he ever got the worm hot; and if not, why not? Because the temperatures in his bottom chambers were extremely high. Then, did the worm chamber ever get hot—that was, the top casting on the underside of the setting? If so, did he find it necessary to open his short-circuit secondary air supplies for cooling? At what pressure, approximately, did he admit his steam into the coke chamber? The author said he had an opening of ½-in. bore in his nozzle. It was stated that the temperature in the lower combustion chambers was from 1300° to 1400° C.; and though the producer gas inlet into the combustion chambers was arranged at such an angle that the flame would not impinge upon the retort, he imagined that silica, and not fire-clay, must have been employed. The coke production seemed somewhat high at 13·36 cwt. per ton. Was this perfectly dry coke, or had it been slaked at all? If the latter, what percentage of water was there in it?

Mr. J. H. Brearley (Longwood) said the paper was just of the kind that those who had vertical retorts to work would welcome. There had been a good many constructional papers in the past; but they had been very slow to get contributions of the practical nature of that now submitted. The knowledge of vertical retorts was going to accumulate very rapidly in the near future. They all knew about the construction of them; and what they wanted to learn about were the working points, so as to see how near to perfection they could attain. He had not had the lengthy experience of Mr. Blundell with verticals, but had had a few months' working; and though he knew much more about them than was the case a short time ago, he realized that there was yet much to learn. With regard to the composition of the gas, it was undoubtedly true that one got it remarkably constant with vertical retorts; and this was one of the main advantages in these days, when they were striving to give their consumers something that was reliable and constant in the matter of calorific value. It seemed to him that the author had given a little more credit to steaming than it was fairly entitled to. If they looked at the diagram, they would see that the temperatures at which he had worked without steaming were considerably lower than those at which he worked with steaming. If they took the average of the temperatures, it would be seen that without steaming it was about 1210° C.; and with steaming, it came to 1370° C.—an average increase in temperature in the combustion chambers of no less than 160° C. He had been wondering what would have resulted if Mr. Blundell had worked without steaming at the higher temperature named. Nevertheless, if he was not mistaken, the author had given to steaming all the credit for the increased make. At all events, there was no qualification introduced with regard to the difference in temperatures between the two methods. Mr. Buckley had raised a point as to the material used. No doubt, he had some special material, which enabled him to reach a temperature of 1400 with perfect safety, and without fear of fluxing. In his own case, they steamed; but they had higher top temperatures, such as Mr. Blundell had when he did not steam. Though he was not in a position to give figures, he could say with confidence that there was a great deal of advantage with steaming. Yet, as he had said, he had not brought the higher temperatures to the lower regions of the retort; they simply worked with a greater top temperature, as was done without steaming. Although they had higher top temperatures, as against Mr. Blundell's higher bottom temperatures, their temperature at the retort-house governor was no higher than that quoted in the paper. He would like to know, with Mr. Buckley, to what pressure the steam was reduced before being admitted to the nozzle. The table comparing results with and without steaming, he took it, did not relate to actual results. It was really a hypothetical table based on actual results obtained. He was rather surprised to see that, with steaming, the author anticipated that he would have a sale of coke of 10⅜ cwt. per ton of coal. Of course, he (the speaker) was young to the business; but he saw no prospect of ever getting to anything like this figure for sales of coke with steaming in vertical retorts. He hoped, however, it might come along. Although it did not arise strictly out of the paper, perhaps the author would tell them what his actual sales had been for the last twelve months. Also whether this 10⅜ cwt. was after making allowance for firing the boilers from which he got his steam.

Mr. Blundell: No.

Mr. Brearley said he thought not. The matter of the producer doors was very important. He had to some extent experimented in this direction, and was very optimistic that they would find the best method of regulating vertical retorts would be to have the producer doors wide open. There were a great many advantages from this plan, which the author had set out; and he would strongly advise them to experiment on these lines. It was, he thought, the right method on which to proceed. The stream of producer gas would be more regular and the fuel used would be less, if they could work with the producer doors wide open. The size of the unit was a matter to which very careful attention should be given by engineers contemplating the installation of vertical retorts. Otherwise they would find there would be a great expenditure of fuel on stand-by units, which might be avoided. Makers of verticals should be equally anxious to produce units of a smaller capacity, if possible, for small works, so that the size of the stand-by plant would bear some relationship to the size of the undertaking.

Mr. S. Tagg (Preston) said the author showed some remarkable results—first, in the very considerable reduction in his cost of gas; secondly, in the saving effected in the coal carbonized; and, thirdly, in the increased capacity of his plant. The last-named was a matter of very great importance at the present time, particularly for those undertakings that had to take up their peak load with water gas. If, as the result of the adoption of steaming or other methods, they could increase their coal-gas production, it would avoid the necessity of using so much water gas, and thereby save the heavy cost of gas oil. He would therefore have been glad if this important claim had been supported by some figures other than those at the beginning of the paper,

where the capacity was said to have been increased by at least 20 p.ct. What he meant was that he would have liked a comparison of the actual figures before and after steaming. Had the author, prior to this five months' test, used some steaming, as he assumed a steam-jet was provided? He might have enlarged the orifice and increased the pressure; but it was a question of more steam, and not of comparing it with conditions under which no steam was used. He thought the point raised by Mr. Brearley, that the increased production was not due to increase of water gas, was the right explanation of the results. The ground for this view, it seemed to him, was that in the paper they learned that the rate of extraction of coke was reduced by 10 p.ct. They had, then, a slower passage of coal through the retort, and an increased temperature right through it. As a matter of fact, the difference in the makes between the 12,000 c.ft. without steaming and the 15,000 c.ft. while steaming, was an increase per ton of something like 28 p.ct.; and he thought it was inconceivable that this 28 p.ct. was blue water gas. The calorific power of the gas with steaming, compared with that before steaming would be very much more greatly reduced than the figures submitted really showed—namely, from 530 to 509 B.Th.U. Assuming the calorific value of the blue gas to be 300 B.Th.U., and taking a mixture of 10 p.ct. of blue water gas with the coal gas made before steaming, they got a figure which corresponded with that obtained while steaming; and he thought the explanation was that, with the higher temperatures and reduced flow, the yield of gas had been very much greater. This was rather confirmed by the experiments referred to by Mr. Buckley. In that case, Mr. Newbigging dealt with experiments with Lancashire, Yorkshire, and Derbyshire coal, carbonized at low and high temperatures, and gave the calorific power and make per ton; and multiplying these, one got the calorific multiple. These were in millions; but he would speak in units. With Lancashire coal, with a make of 11,800 c.ft. of a calorific value of 587 B.Th.U., the multiple was 6·96. With Yorkshire coal under similar conditions, it was 6·98; and with Derbyshire coal, 6·74. Now, at the higher temperature, the calorific multiple went up to 7·19 for Lancashire coal, 7·8 for Yorkshire, and 7·76 for Derbyshire coal. In other words, taking the average of the three coals, a low-temperature multiple of 6·9 became at a higher temperature 7·58. Well, what were the figures at Macclesfield? They were 6·38 calorific multiple under normal working, which was considerably lower than the average of the three tests obtained on the Droylsden plant, which was 6·9; and the higher heat at Droylsden gave 7·58, against the 7·88 resulting from Mr. Blundell's experiments while steaming. Therefore, assuming there was a large excess of steam being passed through the retort, his figures were not very greatly above those obtained at Droylsden, where the steam admitted was only under normal conditions. It seemed to him, speaking from water-gas practice, that it would be very difficult to pass through the walls of the retort in the lower chamber the volume of heat required for the conversion of steam into blue water gas. They had to remember that the steam was cooled by contact with the worm and by contact with the coke in the cooling chambers; and the tendency was for very great condensation to take place in the lower sections of the retort, and for very little steam to actually come in contact with the incandescent coke. In Preston, they were experimenting on similar lines, having increased the orifice of the steam jet; and they found very excessive condensation from the retort mouthpieces. He thought Mr. Blundell would, on further investigation, desire to modify some of the conclusions drawn from the analyses. In fact, he thought he had himself admitted that these analyses were in the nature of rough tests to control the working; and yet he had used the figures to determine the amount of blue water gas made. He suggested to Mr. Blundell that he would have to increase very materially the figure of 25 lbs. as the amount of carbon converted into water gas in the retort, if the assumption that the increase was due to blue water gas was correct. This would equally affect the figures of the fuel required for the steam used. In referring to liquor of 10 oz. strength, had his figures for ammoniacal liquor actually been adjusted to this, or was the strength assumed?

Mr. J. W. Thompson (Barnoldswick) said he found he could increase the make per ton about 1000 c.ft.; but he got a larger make than the author under normal conditions. He generally worked from 13,000 to 14,000 c.ft. per ton. There was really no doubt about the production of tar. In his own case, last year they sold 18·3 gallons of tar per ton of coal carbonized. There was still room to move in this direction. As to the method of heating the retorts, he had been making experiments with reducing his primary air to the very lowest point. He generally worked with an opening of ¾ in., and as a rule had not to attend to any dampers more than once a year, when he let-down one section of the plant. Before heating it up again, he looked to the dampers, and did not touch them again until the setting was let-down another year. He could see that if they adopted the open door of the producer, there was one problem that could be settled, and that was they could then heat more retorts from the one furnace. Under his own plan of working, the uptake was the coldest part of the plant; whereas in the case before them it would probably be the hottest. He could thus quite see in a setting of sixteen there would be one point where a flue could be taken off from the generator that would supply an additional two retorts in case of emergency. His own plant had been working just on four years; and for anything he knew, it would in likelihood be at least another three years before it would need any repairs. The paper would prove that vertical retorts were, no doubt, in a crisis, the very best form of plant they could have.

Mr. West said there was one point he had forgotten to mention—about the unit that should be adopted for small works. This was a very important matter; and it had been dealt with, by a plan which was already in operation in some very small works in which they had put one bed of eight retorts. It was possible to start with one, and go on up to eight retorts gradually, as desired. He would shortly be making a statement as to how many days each of these retorts had been in active operation. The primary air was reduced in accordance with requirements. It was an important difficulty; but it had been met, and the arrangement was doing well.

Mr. J. M'Nicholl (Mossley) said he had taken out the weights of the products stated in the paper, and found that by the process of carbonization a ton of 2240 lbs. was increased to about 2331 lbs. He worked it out in this way: 15,358 c.ft. of gas, 470 lbs.; 13·36 cwt. of coke, 1496 lbs.; 16·61 gallons of tar, 178 lbs.; 25 gallons of liquor, 250 lbs. This totalled to 2394 lbs. They could allow Mr. Blundell 25 lbs. for carbon that was converted into water gas, and also make allowance for the steam; and if these were deducted from the 2394 lbs., he had still 2331 lbs. to come out of 2240 lbs. This seemed to him to be rather an abnormal result; and he would like to have some explanation of it.

Mr. J. P. Leather (Burnley) said he felt inclined to offer a little criticism on the question of the products from a ton of coal, which he put in a rather different way from what had already been done. He had worked it out from the figures of analysis that Mr. Blundell had given. From these, it seemed that he now produced 494 lbs. of gas from a ton of coal, whereas formerly it was 371 lbs.; and an increase of 123 lbs. in weight of gas per ton of coal was most remarkable. Reference had already been made to the increase of 58 lbs. in the quantity of tar. The increase must come from somewhere; and he would like to know where it did come from. There must either have been great waste before, or he was getting more than a ton of products from a ton of coal. There was, of course, a decrease shown in the coke. There seemed to him to be something that could not quite be explained in these figures. At the same time, he was not at all casting doubt upon the general results, which were most interesting, and which all of them who had vertical retorts would try to emulate. He was not able to give any figures of his own. In this regard, he always felt in a difficulty, because he was not able to measure his gas in every case separately. Therefore, he was merely criticizing from a scientific point of view. Of course, he took it Mr. Blundell did not claim all this as water gas. His table showed that it was not. Taking out the gas produced as water gas, there was an extra quantity of CO of 693 c.ft., and of CO_2 of 99 c.ft. With a similar quantity of hydrogen, they should have about 700 c.ft. more; but he had 1652 c.ft. more. So that there was 950 c.ft. extra of hydrogen and 636 c.ft. of methane per ton of coal which were not water gas. At the same time it might be—and they could quite understand scientific reasons for this—due to steaming, because the steam acted in a way which he thought Professor Lewes suggested water gas would do in a retort—it helped in getting off the gas from the coal. These were very interesting figures; and he only wished more of them had the opportunity to give the amount of attention which Mr. Blundell had devoted to getting out analyses of his working and to studying results from the scientific point of view, apart from the financial, which, of course, must be the important thing eventually. At the same time, he did not see how they were going to get more than 2240 lbs. out of a ton. He assumed the virgin liquor was the same. It would have been interesting to know how much water the author used to produce this extra liquor; but it was not to be expected there would be very much less water in one case than in the other.

Mr. A. J. Harrison (Padiham) said that there had been much talk, but very little had appeared in the Technical Press on the question of steaming; and the paper would be extremely valuable to those engineers who were not so happily situated as Mr. Blundell for carrying out these experiments. In the pages of one of the Technical Journals a short time ago, he noticed a statement urging that, if blue water gas was to be mixed with straight coal gas, a water-gas plant was the process to adopt, not the turning of a costly setting of verticals into a water-gas plant. And then, it was asked, "Who will argue to the contrary?" Personally, he thought Mr. Blundell had given a very sound argument to the contrary. People seemed to forget sometimes that the country was at war. They had got to increase their output; and if they wanted to put down separate plant for carburetted water gas, they would not be able to get it. So it was "up to them" to increase the output as much as possible by other means. He had been going on these lines for some considerable time; and while he had got fairly satisfactory results, he had not arrived at anything equal to what was shown in the paper—certainly not to the extent of getting 21 cwt. to the ton. He agreed that some of this was due to the weight of the water in the washer. Possibly this was included in some of the calculations. Had the author had any trouble with the steam nozzles making-up? It would appear that, with a temperature of 1350° C. at the base of the retort, under the conditions shown, they were "asking for trouble." Was he right in assuming that the author did not superheat his steam, apart from passing it through the coke in the extracting gear? Had he noticed any difficulty from the accumulation of solid matter in the hydraulic and collecting mains? Because, over twelve months' running up to now, he (the speaker) had taken out considerably less than a bucketful of solid matter from his collecting mains right up to the retort-house governor. Wear and tear on the mouthpieces due to condensation of steam was a small item on a small setting; but it would be a big thing in a large setting. In one part of the paper the saleable coke was given as 10¾ cwt.; and in another part it was stated that in general practice the coke would be reduced about ¼ cwt. If there was ¼ cwt. to come off the table showing the saving effected by steaming, this would amount to a considerable figure, and substantially affect the saving. What moisture did the coke contain? Did it come out of the extractors hot, and need quenching, or was it coming out as cool as previously?

Mr. J. T. Broughton (Congleton) said that about 75 p.ct. of the members of the Institution represented works making from 50 to 120 million c.ft.; and the question of the dimensions of the unit was a very important one. What had so far been rather a bugbear for the smaller works was the extraordinary amount of fuel that would be required under certain conditions. He was therefore very pleased to hear Mr. West say that information would be available shortly on this point.

The President remarked that Mr. Bond was with them; and they would like a few words from him, as he had had a very lengthy experience with vertical retorts.

Mr. John Bond (Southport) said that they in Southport felt a certain amount of reflected glory in Mr. Blundell bringing forward this paper, as he had been connected with the gas undertaking there. They all knew that the Government had been calling upon the industry to produce more tar. It was urgently required; and he (the speaker) was asked to consider certain processes to endeavour to find out whether further quantities of tar could be obtained. Now, he had investigated a great deal of the matter which Mr. Blundell had brought forward; and he

could with confidence support the whole of what was included in the paper. He had got the increase in tar, and a tremendous increase in the make of gas. He had watched carefully the process of steaming; and he had come to the conclusion that, not only were carbon monoxide and hydrogen made, but there was also a certain—and rather large—quantity of methane produced. Steaming further had the effect of removing a large quantity of the volatile matters that were not removed in some processes of carbonizing; so that they were not only getting methane, carbon monoxide, and hydrogen, but also other hydrocarbons, present in the gas. This, he considered, was an advantage. Now, why had Mr. Blundell been able to carry out these important experiments? Simply because Parliament had removed restrictions which had hindered the gas industry for a considerable period. That was to say, they had removed the restrictions with regard to illuminating power; and he sincerely hoped that Parliament would not fetter the industry in the future by making restrictions too hard with respect to calorific value. If Parliament wished to impose any restrictions on an important industry, he ventured to think that they should do it in connection with the inert matter which was contained in some qualities of gas. ["Hear, hear."]

The PRESIDENT said that a written communication had been received from Mr. George Helps, of Nuneaton. In a letter which accompanied it, Mr. Helps himself suggested that, if time pressed, the statement should be handed to the Press instead of being read; and as time was getting on, this would be done. [See p. 220.] Mr. T. Duxbury, of Oldham, was not very well. He also had been experimenting in this direction, and had he been able to attend would have been pleased to give the results to the meeting. With regard to his (the President's) own plant, two-thirds of the gas was produced in verticals and one-third in horizontal retorts. They had not done very much steaming; but they had done a little. For the half year ended September, without steaming, the average make per ton was 12,648 c.ft.. of 529 B.Th.U. gross calorific value. Since then, with steaming (13 p.ct. horizontal, and 87 p.ct. made in verticals), the make of gas per ton had been 14,026 c.ft., of a calorific value of 512 B.Th.U. gross. The maximum make was 15,319 c.ft., and the minimum 12,851 c.ft. They had, of course, not been steaming very long. Mr. Blundell's results were certainly very remarkable; but it would have been far better if they could have been obtained with the same classes of coal for the same period. With reference to his output, 656,000 c.ft. out of a 500,000 c.ft. plant was an extraordinary result; and he would like to know whether he had had nuts coal, which would pass quickly through the retort. His output was very great, and he (the President) could not do anything like it. The question of the unit was very important for anyone who was contemplating putting in verticals. In the comparative statement of results, a little credit ought to have been taken for labour saving in the increased production of gas per ton; so that really the results were even better than were given in the paper.

Mr. BLUNDELL, on rising to reply to the discussion, said how pleased he was that Mr. West had found it convenient to be at the meeting. They all knew he was in the forefront of anything connected with gas engineering; and to him (the speaker) he had always been a great friend. Mr. West wanted to know whether the tar and liquor were measured to decimal points. At the end of March they cleared out the tar-well; and at the end of August, the date given for these figures, the same thing happened—the well being entirely emptied. The figures included in the paper represented tar actually sold and paid for. They had been steaming for probably a little more than two years, gradually going a little further and a little further. They commenced with a make of just over 12,000 c.ft. This was satisfactory; and they went to 13,000 c.ft., then to 14,000 c.ft., and now they had got to 15,500 c.ft. per ton. He felt sure they had still a little bit "up their sleeve," and would soon reach 16,000 c.ft. As to whether the results had been maintained, before coming away to the meeting that morning he got out the figures for the last four days. They had two beds going of sixteen retorts; and the average make of gas for the four days per bed was 628,000 c.ft.; the coal carbonized per bed was 40 tons; the make per ton was 15,680 c.ft.; the make per retort was 39,250 c.ft.; and the gross calorific value was 512 B.Th.U. Thus he thought the results were being maintained. As to the analysis of the gas, right up to date in no case did the incombustibles exceed 8 p.ct. With reference to the cost of manufacturing blue gas in a separate generator, as compared with the making of it in vertical retorts, they had at Macclesfield a carburetted water-gas plant of a capacity of 800,000 c.ft. per 24 hours. If he had to meet his requirements with this—which would be 200,000 c.ft. per day—he would have to work one shift; and to make blue gas in the generator he would want a relief holder of a size he had not got. But taking it under the best conditions, with present prices for labour, and reckoning the plant being continously at work during the 24 hours, the cost for labour alone would be 0·63d. per 1000 c.ft. of gas. Taking the generator fuel at 39 lbs. and the boiler fuel at 11 lbs. per 1000 c.ft.—and these were not high figures, they were figures he had last year when working the plant—and reckoning the coke at 1s. 2d. per cwt., the cost for the coke would be 6·25d. per 1000 c.ft. This meant that to produce the water gas in a separate generator, under the best possible conditions of continuous working, would cost 6·88d. per 1000 c.ft. To make this water gas in the vertical retorts, and taking the high figure he had put in his paper, of 74 lbs. of extra coke required per ton of coal carbonized—25 lbs. carbon converted into water gas, 25 lbs. for extra fuel to the producer, and 24 lbs. for fuel supply to boilers—on 80 tons of coal the coke requirement would be at the very least 52·8 cwt. This, at 1s. 2d. per cwt., divided by 200,000 c.ft. of water gas, cost 3·69d. per 1000 c.ft. of gas made. These figures were on the high side; and the separate generator figures were on the low side. In answer to the question by Mr. Buckley, he might say that he had had no experience with a hot worm; neither had he had any trouble with the worm chambers getting hot. He thought the steam kept them cool. The pressure of the steam introduced into the worm chamber was reduced by a reducing valve to 10 to 15 lbs. Silica segments were used for the retorts, not fire-clay. The figure for coke production referred to dry coke, and it came out cool. The figure probably might seem high to some of them; but they included all the coke from the producer screenings. They had a man who did nothing else, and earned for them a good deal more than his wages in screening; and this was taken to the boilers. The figure given was not coke sold, but coke saleable. This was stated. He was asked to give actual figures relating to the sale of coke. Now, last year was a very bad year for coke at Macclesfield. The vertical retort plant was under repair; and they had to use considerably more coke in the producers than they would have done had the plant been in good order. On one occasion, they only had sixteen of the vertical retorts going; so that the coke used must have been high. The coke actually sold last year was 9·65 cwt. per ton. This, of course, did not include boiler fuel. A chart which he had for inspection would prove that the quality of the gas was constant. As to the temperatures prior to steaming, he could only say that they were high enough to burn off the charges and to extract the whole of the gas from the coal under the old method of working. As to the nitrogen content, as the figures shown in the table were comparative, and the nitrogen content was high for 1915 as well as 1917, it would not make any difference. With regard to the ammoniacal liquor figures, they were not assumed, but had been adjusted. Mr. M'Nicholl had spoken about the 2240 lbs. to a ton. He knew all about this; and the only thing he could put it down to was the addition of water in the scrubbers. He believed in putting down one's figures, whatever they were. It did not matter to him if he got a little more than 2240 lbs. to the ton. He had got it; and he did not look for the reason. As he had said, he put it down to the addition of water in the scrubbers.

Mr. M'NICHOLL: That will not account for it.

Mr. BLUNDELL: It will account for a good deal, I assure you. Continuing, he said that so far the steam nozzles had not made-up. The steam was always on. He had had no trouble about solid matter in the collecting mains. Flushing the mains with ammoniacal liquor kept them clear. They had a tundish into the collecting main from an overhead tank of liquor; and it was always running in a steady stream into the collecting main. They had only had to have the bottom mouthpieces of the retorts looked at once in over five years. The coke was now coming out of the retort quite cool. He had not disconnected the bottom steam nozzle. It was still admitting a very slight quantity of steam, and probably was helping to keep the coke cool. He purposely left out the saving that would accrue in labour, wear and tear of plant, and coal handling. It could be added to the financial statement he had given.

A Written Communication from Mr. George Helps, of Nuneaton.

The point I wish to speak to is the B.Th.U. in the gas obtained from a ton of coal with and without steaming:

15,360 c.ft. of 510 B.Th.U.	(with	steaming)	is	7,832,580 B.Th.U.
12,049 ,, 530 ,,	(without	,,)	is	6,385,970 ,,
	Difference			1,446,610 B.Th.U.

Mr. Blundell apparently attributes the whole of this increase in B.Th.U. to the steaming. I most emphatically differ from him on these grounds.

Steaming or making blue water gas must reduce the quality of the gas. If, therefore, without steaming 12,049 c.ft. of gas is made, and with steaming 15,360 c.ft., the difference between the two yields must be attributable chiefly to water gas. The difference in volume of 3311 c.ft., if taken as blue water gas of 300 B.Th.U., represents 993,300 B.Th.U. If this reasoning is sound, and I think there can be no question about it, then the difference between 1,446,610 B.Th.U. and 993,300 B.Th.U.—453,310 B.Th.U.—should be added to the gas made without steaming, and so increase the total B.Th.U. in this case from 6,385,970 B.Th.U. to 6,839,280 B.Th.U., thus bringing up the quality of the non-steamed gas to 567 B.Th.U. gross. The steaming can only be made to account for 3311 c ft. of 300 B.Th U. gas.

The yield of gas from a ton of ordinary coal such as that used in any good system of carbonization, horizontals or verticals, would be 6,839,280 B.Th.U gross; and if Mr. Blundell does not get such a yield in his verticals without steaming, there must be something wrong, or something happening which prevents his obtaining this quite ordinary result.

There are doubtless many members of the Manchester District Institution making fully 6,839,280 B.Th.U. gross (which would be represented by 13,670 c.ft. of 500 B.Th.U. gas) from a ton of coal year in and year out with horizontal retorts. To me, the main question concerned in Mr. Blundell's most interesting paper is what B.Th.U. can be obtained from a ton of coal without steaming; and he is only entitled to add to the B.Th.U. content of his gas any B.Th.U. that he can obtain that are entirely due to the vertical retort setting, and which cannot be obtained in the ordinary nature of horizontal practice. If in the case of horizontal working, the costs of making blue water gas are more than in the case of verticals, he is entitled to claim such.

I cannot see that on any reasonable ground whatever the making of blue water gas in a vertical retort setting can be put forward as an advantage of vertical retorts. If, with a horizontal setting, it is desired to add 3311 c.ft. of blue water gas to the gas made from each ton of coal, a producer into which hot coke from the retorts may be drawn can be rigged up anywhere in the retort-house, and steam applied to it, and the hot blue gas passed through the usual horizontal setting. Mr. Blundell may say that he is not comparing verticals with horizontals, but simply giving his experience of the advantages of steaming in verticals compared with no steaming. This he has most certainly done, and to a considerable extent done well. But all his brother engineers who are using horizontals will compare his results with their own, and try to find very definite advantages.

Tar.—Mr. Blundell shows 10·9 gallons from the coal used without steaming. This seems to me to be a very low yield for vertical retorts; and it would appear that in his working without steam he was destroying altogether some of the oil hydrocarbons.

The coal is admittedly different in the non-steaming test. It has 2 p.ct. less volatile matter, which represents 44 lbs. of something. This 44 lbs. might produce 44 lbs. more gas or 44 lbs. more oil. If oil, it

would account for something like 4½ gallons; if gas, something like 1340 c.ft. of 600 B.Th.U., or 744,000 B.Th.U. per ton.

Coke.—The figures given in the last sections of the paper cannot all be correct. It is stated that the yield of coke by the old process is 11 cwt. and by the steaming one 10¾ cwt. The extra volatile matter, 2 p.ct., means 44 lbs. less coke per ton. Adding to this the 74 lbs. of coke per ton mentioned by Mr. Blundell, the total is 118 lbs. less coke per ton from the new process; and the actual yield would probably be less than this.

I am prepared to admit, for the purposes of debate, that steaming will give an increased yield of 3311 c.ft. or 993,300 B.Th.U., and that such increased yield would not cost more in coke and steam than the same quantity made in an ordinary blue water gas plant making (say) 60,000 c.ft. from a ton of coke. The coke used in boiler and producer would therefore be (say) 1¼ cwt. I do not follow Mr. Blundell's arguments that the coke for sale would only be reduced about ¼ cwt.

The financial table would need careful revision before being passed, especially the two items coke and tar. The coke is certainly put down too high in the steaming process, and the tar too low in the non-steaming process. It is unfortunate that the coals were changed, for this makes the comparisons of the processes of much less value than they otherwise would have been.

SIXTY YEARS AGO.

From the "Journal" for October, 1857.

A Depressed Coke Market.—The last general meeting of the Imperial Gas Company presents a practical confirmation of our recent observations upon the state of the Metropolitan market for gas coke, and must direct attention to devising some plan for its relief. The startling fact of an increase of £9000 in the value of the coal carbonized by this Company during the first six months of this year, beyond that of the corresponding period of 1856, being attended by a decrease of £1750 in the sum realized by the coke, is sufficiently indicative of the position of the market and of the daily-increasing sacrifices which must be submitted to in order to force sales. From a statement before us, it appears that for the half year ending June 30, 1856, the coke, tar, and liquor of the Imperial Company realized only 32·74 p.ct. on the cost of the coal. This has sunk to 26·81 p.ct. for the first six months of this year; and this difference tells heavily in the balance-sheet of a company of the magnitude of the Imperial, whose dividend has been thereby reduced from 10 to 7 p.ct. Not many years since, the Metropolitan Gas Companies realized nearly 50 p.ct. upon the cost of the coals by the sale of these residuary products; and, if the experience of the Imperial is confirmed by that of the other companies, their aggregate deficit upon this source of income will amount to nearly £120,000 per annum. Some companies, however, obtain better prices than others, in consequence of their local position; but our belief is that £100,000 will barely cover the present deficit, and that it will steadily increase, though we do not despair of seeing some process successfully introduced by which this state of things may be improved.

Some Early Special Acts.—At the request of several of our subscribers, we subjoin abstracts of the fifteen Acts of Parliament relating to the supply of gas which were passed during the last session. Seven were for the incorporation of companies that were previously acting without parliamentary authority; five were for the amendment of existing Acts and for obtaining additional powers; one was for the amalgamation of two companies; one for regulating the payment of dividends on preference shares; and one for the transfer of works to commissioners. In all these Acts, with the exception of that for regulating the payment of dividends, clauses are inserted to provide for the testing of the quality of the gas by experimental meters on the premises of the companies, who are to have six hours' notice before the experiments are made. The costs of the experiments are to be borne by the parties making application for the test where the quality is proved to be equal to the parliamentary standard; and when below it, the companies are to pay the cost, in addition to a penalty not exceeding £20. The minimum quality is, with three exceptions, fixed at 12 sperm candles of six to the pound, burning 120 grains per hour.

GAS FOR BAKERS' DUTCH OVENS.

An article in the "American Gas Engineering Journal" makes out an excellent case for the use of gas in bakers' ovens, in preference to wood or coal, on the lines of quicker service, longer working life of the hearth and oven (which means less standing-off for repairs), saving of labour, cleanliness, and efficiency. That some of these advantages have received official recognition is evident by a statement made by the State Bakery Inspector of Wisconsin, to the effect that "in bakeries with inside ovens, and to a slightly less degree with furnace ovens where wood is used for firing, gas for fuel ranks with dough mixers as an aid to convenience, cleanliness, and sanitation. Bakeries using gas for fuel will be given preference by a discriminating public, and by the discerning, desirable, cleanly, wide-awake workman, who strives to be an efficient mechanic, rather than a mere bakehouse drudge."

The general introduction of strict sanitary regulations for establishments of this kind, and of smoke abatement, was a great assistance to the gas salesman. Gas dispensed with the operation known as "swabbing out" the oven, which is necessary when solid fuels are used. The application of a fan-blast burner is considered the simplest and most effective way of using gas at ordinary pressures. It is mounted on a swing joint, so that it can be inserted into the mouth of the oven, or turned back out of the way, as required. The principle of the union jet has been utilized for the production of a flat flame; and air is supplied under pressure by a small motor fan. Single, double, and three flame burners are also used, according to requirements. It is particularly necessary to guard against excessive draught, which causes waste of heat and extravagant consumption of gas. The outlet damper must be carefully adjusted to the minimum point that will secure the free escape of the products of combustion, and avoid smothering the flame.

In a bakery employing two or three men, 2 to 2½ cords of hard wood are used per month, costing £3 to £4. Gas at 2s. 6d. per 1000 c.ft. would cost £4 to £5; but the greater part of the extra cost is covered by the saving in labour.

ESTIMATION OF BENZOL IN GAS.

A Note on the Deville Method.

The method originated by M. St. Claire Déville for the estimation of benzol by freezing it out of the gas, was the subject of an article from the "Journal des Usines à Gaz" in the "Journal" for Feb. 29, 1916, p. 460 [Vol. CXXXIII.]. Our French contemporary, in then reviewing the stages through which the method has passed in France, was prompted by the act of a German chemist, Dr. Neubeck, of describing one form of the Deville test as an improvement of his own. The French "Journal," in its current issue, is moved now to deal with a Dr. Berthold who, in the "Journal für Gasbeleuchtung," has condemned the Deville test as "too uncertain" in circumstances—*e.g.*, the examination of furnace gases—in which its non-applicability has always been emphasized by the French chemists. In doing so, it refers to one or two minor matters which supplement the details of the test given in our pages in February last year.

For one thing it removes some confusion which still exists between the two forms of the Déville test. That commonly known by this name consists in cooling the gas to − 21° C. with ice and salt and adding the constant of 23·5 grams per cb.m. in respect to the benzol retained in the gas at the temperature of − 21° C. This form of the test is applicable to ordinary coal gas which normally contains from 35 to 45 grams of benzol per cb.m. But, obviously, it is useless for gas after benzol extraction, or for other gases such as those from producers, the content of benzol of which is below the 23·5 grams per cb.m. For these, it is necessary to use the earlier Déville method of cooling the gas to − 70° C., at which temperature its residual content of benzol becomes *nil*.

In answer to Berthold's criticism as to the practical difficulties of the method, it is pointed out that in the course of many years' experience of the test in the Paris Gas Company's experimental works, breakage of an absorption vessel has never occurred; also that 10 kilos of liquid carbon dioxide serve for eight to ten tests, as against one only found practicable by Berthold. Essential elements in the carrying out of the test are: (1) The use of an absorption vessel with an aperture large enough to avoid obstruction by a solid deposit of benzene at the point where the gas first meet the cold walls of the vessel; (2) hermetical sealing, by taps or other means, the inlet and outlet of the absorption vessel before the weighings; and (3) weighing the vessel in the first instance full of the gas at the temperature of the balance, and sealing the vessel while still in the freezing mixture before making the final weighing. Any *plus* error is thus limited to the difference in weight of the gas at − 70° C. and that of the same volume at (say) 20° C. This correction can be ascertained within a milligramme or two, and deduction made from the weight of the benzol. At the same time, it is pointed out that for industrial purposes there is no necessity for such extreme accuracy in the determination.

Leaving Certificates.—The question having arisen as to whether Section 3 of the Munitions of War Act, 1917, enables a workman who has undertaken the performance of a definite job to give a week's notice and leave before the completion of the job, the Minister of Munitions announces that he has been advised that the section does not apply to contracts of service for a definite period or for the doing of a particular job, but is confined to contracts which, apart from the Act, are determinable by notice or at pleasure. The answer is, therefore, that the section does not enable a workman who has undertaken the performance of a definite job to give a week's notice and leave before the performance of the job.

Lighting Agents in China.—According to "Eastern Engineering," electricity seems in China to have been taken up very much more readily than gas. But there is plenty of coal in China from which gas could be made; and the sulphate of ammonia thus obtained would be very beneficial to the land in China if gas-works were to be established there. Moreover, there are the aniline dyes produced; and as China is a very large user of dyes, it is quite possible that she might be able to produce for export dyes that would help her to pay for the machinery she is so badly wanting. Furthermore, the supply of machinery for the manufacture and distribution of gas and for the use of gas for lighting, heating, and for power, might make an important addition to the exports from Great Britain.

FRENCH SOCIETY OF INDUSTRIAL CHEMISTRY.

Particulars reach us of the establishment of the "Société de Chimie Industrielle"—a body representing the movement of a new spirit in France towards making the nation's chemical industry worthy of the great scientific achievements of Frenchmen in the domain of chemistry. In contemplation of the prodigious efforts which Germany has made, is making, and will continue to make in developing its chemical industry as a means of imposing its will (economically and politically) upon the world, industrial and scientific chemists in France have recognized the necessity of organization, and have established the Société de Chimie Industrielle as a medium by which to realize their aims. Thus the professed objects of the Society are the expansion of all branches of the French chemical industry, the grouping of all the members—directors, professors, engineers, chemists, constructors, &c.—of the industry, and the advancement of industrial chemistry from the economic as well as from the scientific standpoint.

The instruments to be used in the prosecution of these ends, as declared in the Society's propagandist literature, are the issue of a journal dealing very fully with its subject; the organization of congresses, conferences, and exhibitions; the establishment of headquarters and the creation of a library; the dispatch of missions to foreign countries; and the formation of local branches of the Society in different industrial districts. The journal is already planned on an elaborate scale, and will begin its publication in January next.

The first list of officers includes, as the two Honorary Presidents, Professor A. Haller, the Principal of the School of Industrial Physics and Chemistry, Paris, and M. Le Chatelier, the Chief Inspector of Mines. Of the Executive, M. Paul Kestner is President, and M. Jean Gérard is General Secretary, and in the Council of about fifty members are two prominently connected with the gas industry in France—viz., M. René Masse, the President of the Professional Gas Syndicate, and M. Daniel Berthelot, the head of the Société Anonyme de l'Electricité et Gaz du Nord. The annual subscription for ordinary members has been fixed at 30 frs. (35 frs. for those resident abroad); but associate members—that is, students at technical colleges or the universities—are admitted at a fee of only 15 frs. They are entitled to all the benefits of ordinary members except the right to vote and to be elected on the Council. The offices of the Society are at No. 49, Rue des Mathurins, Paris.

ENGINEERING TRAINING.

A meeting was held at the Institution of Civil Engineers last Thursday for the purpose of considering the establishment of a central organization for improvement in, and better co-ordination of, engineering training, and for the appointment of a representative Committee of engineering and educational interests in order to initiate action.

The meeting was the outcome of a number of informal conferences of engineers and educationalists which held several meetings during the early months of the year. The object of this conference was to consider certain problems of engineering training, more particularly from the industrial point of view. But it soon became apparent that the amount of useful work to be accomplished was altogether beyond the scope of a temporary conference, although well within the power of some permanent organization. In ceasing its work, therefore, the informal conference presented to the Board of Education a memorandum embodying the suggestion that a bureau might be established within the Department. At the wish of the Board, the suggestion was communicated to as wide a circle of engineers and educationalists as possible, and it elicited strong support. A marked feature of this support, however, was an expression of opinion on the part of many engineers that it would be preferable to establish the proposed organization upon an independent footing; so that, while co-operating closely with the Board of Education and other educational bodies, it might be free from Government finance. As a consequence, those more intimately concerned requested the Council of the Institution of Civil Engineers to lend their theatre for a meeting at which the real need for such an organization might be confirmed and some definite proposal formulated, after discussions of the subject, by the principal engineering and educational interests.

The following are the three objects in particular on which it is thought the proposed central organization might usefully concentrate its attention.

1.—The co-ordination of engineering training, including the fostering of apprenticeship as a national institution, and the consideration of means by which the work period of an engineering pupilage may be increased in efficiency and a wider appreciation secured for the value in industry of education of University rank.

2.—The maintenance of a central bureau where parents and educationalists can obtain accurate and comprehensive information relating to the engineering industry, and the proper course to pursue on behalf of boys who are desirous of making engineering their profession.

3.—The promotion of scholarships, or other equivalent means, by which the best talent may be enabled to rise to its proper level under the stimulus of educational opportunity.

The meeting was a crowded one; all the engineering institutions as well as the Universities, Government Departments, and Trade Associations being represented. There was no doubt of the reception which the proposal met with, and the following resolution was passed:

> That this meeting of engineers and educationalists is of the opinion that a need exists for improvement in and better co-ordination of, engineering training, and considers that some form of central organization is a desirable means to this end. It is therefore resolved that a representative committee, with power to add to their numbers, be appointed to initiate means that will give effect to this principle of a central organization, and that the first members shall be representative of the following bodies.

Then follows a list of 26, including engineering and scientific societies, the Board of Education, trade associations, universities, and technical colleges of university rank. The list includes the Institution of Gas Engineers, for whom Mr. A. E. Broadberry was the delegate at the meeting.

Pending further developments, communications may be sent to Mr. A. P. M. Fleming, British Westinghouse Company, Trafford Park, Manchester, or to Mr. A. E. Berryman, the Chief Engineer of the Daimler Company, of Coventry, who acted as Honorary Organizers of the meeting.

Safeguards against Spontaneous Combustion.

In consequence of the fact that many users of coal who are taking in reserve stores this winter have applied to them for particulars of safeguards (more particularly in respect of spontaneous combustion, where coal of an inferior quality has to be stacked), the British Fire Prevention Committee, after consultation with the departments primarily concerned, have decided on the issue of a warning notice. The safeguards recommended are that stacks should not be higher than 10 ft.; that perforated pipes with the lower ends at different levels should be inserted vertically in the stacks as they are built up (one pipe or duct to about every 300 sq. ft. of surface); that a thermometer should be lowered occasionally through these pipes or ducts, to ascertain the temperature at the centre of the stack; and that, if wet, very small, very soft, or impure coal is received, it should be dumped around the edges of the stack, or in some location where the air can get to it freely, and where other coal will not be packed on top of it. General suggestions are added on the subjects of matches, sparks, cleanliness, fire appliances, frozen hydrants, and stacking. Copies of this warning notice may be obtained from the offices of the British Fire Prevention Committee, No. 8, Waterloo Place, S.W. 1, on written application to the Registrar, enclosing a stamped and addressed foolscap envelope.

Treatment by Ammonia of Oil Containing Sulphur.

In an article by Dr. F. Mollwo Perkin, in the "Oil, Paint, and Drug Reporter," the author mentions that he and Messrs. Lucas and Palmer have devised a process (which is as yet only in its initial stages) for treating oil at high temperatures with gaseous ammonia. The oil may either be liquid or gaseous. If it is liquid, the pressure must be kept sufficiently high to prevent the oil gasifying at the temperature to which it is subjected. On the other hand, the temperature should be sufficiently high to cause the ammonia to commence to dissociate. When the oil is treated in the form of vapour, it is passed through a heating system together with the ammonia before being condensed. They have found that sulphuretted hydrogen is given off from oils containing sulphur when treated in this way. It is an interesting point that oils containing sulphur, when heated in contact with ammonia, give off no sulphuretted hydrogen until a specific temperature is reached. This temperature appears to vary with different oils. The quantity of ammonia required seems to be only that necessary to react with the sulphur present in the oil to form sulphuretted hydrogen. The authors believe that the action is due to the dissociation of the ammonia; and, furthermore, they are of opinion that, with unsaturated sulphur compounds, saturation as well as desulphurization may take place.

Nitrate of Soda Classed as "War Material."—The Minister of Munitions has made an Order, dated Oct. 19, to the effect that the war materials to which Defence of the Realm Regulation 30A applies shall include nitrate of soda. All applications and communications in connection with the Order should be addressed to the Department of Explosives Supply, Ministry of Munitions, Storey's Gate, Westminster, S.W. 1. The regulation is to the effect that "no person shall, without a permit issued under the authority of the Admiralty or Army Council or the Minister of Munitions, either on his own behalf or on behalf of any other person (*a*) buy, sell, or deal in, or (*b*) offer or invite an offer or propose to buy, sell, or deal in, or (*c*) enter into negotiations for the sale or purchase of or other dealing in any war material to which this regulation may for the time being be applied," &c.

FILLING ARRANGEMENTS FOR GAS CONTAINERS.

[A Scheme submitted at the Meeting of the Manchester District Institution of Gas Engineers, Oct. 27.]

The following suggested scheme was submitted to the members of the Manchester Institution last Saturday, regarding the filling arrangements for containers of gas-driven motor vehicles:

At a meeting of the General Committee, held on Oct. 5, it was resolved that the following constitute a Committee to consider and report on the suggested standardization of filling arrangements for containers for gas-driven motor vehicles:

Mr. W. Whatmough (Heywood), *President.*
Mr. J. P. Leather (Burnley), *Vice-President.*
Mr. S. Meunier (Stockport) and Mr. H. Davies (Brighouse), *Members of General Committee.*
Mr. H. Kendrick (Stretford) and Mr. W. M. Barrett (Manchester), *Co-opted Members.*
Mr. G. S. Frith (Runcorn), *Hon. Secretary.*

The Committee now submit the following suggestions for consideration by the members:

Meter.—A special meter to be fixed capable of passing 1500 c.ft. per hour at 2 in. pressure. The working parts to be of sufficient strength to withstand continuous working at the maximum rate. The meter to have a special dial with unit centre finger capable of being turned back to zero, and to register 1000 c.ft. per revolution by divisions of 10 c.ft.

Connections.—The inlet and outlet connections to be full-way 3 in. diameter, and provided with flanges. Meters should be fitted with full-way cocks or valves on inlet and outlet, and are recommended to be connected in such a manner that both can be actuated by one movement. Each installation to be supplied with a suitable length of flexible metallic or armoured hose, fitted at the end with a 2-in. cast-iron bayonet-joint coupling.

Filling Stations.—It is recommended that the position of filling stations shall be arranged in consultation with neighbouring authorities, so that there shall be no overlapping.

Price.—The charge for gas to be at the nearest penny per 100 c.ft. to the ordinary lighting rate prevailing in the respective areas, and a charge for attention and connection not exceeding 6d. may be made each time a supply be taken. It is recommended, for the guidance of authorities who may decide to supply gas without registering by meter, that makers of gas-containers be requested to mark the capacity of the container in large figures on both sides.

Instructions for Filling.—A notice, lettered as follows, to be fixed in a prominent position at each filling station:

INSTRUCTIONS.

1.—Connect-up coupling end of flexible tube to inlet-pipe of gas-container, taking care that all joints are gas-tight.
2.—If the vehicle is fitted with a main cock on the inlet-pipe to gas-container, see that it is open. Close engine control cock. Open main cock on gas-meter outlet.
3.—When gas container is filled—
Close main cocks on gas-meter.
Close main cock on inlet of gas-container.
Disconnect flexible tubing.

NOTE.—It is important that the inlet-cock on the gas-meter should be closed when the filling station is not open for business.

Advertising.—That the British Commercial Gas Association be requested to collect information from the various towns or districts as to positions of filling stations, and other necessary particulars, and arrange with the Commercial Motor Users' Association for publishing same in their booklet. Notices to be provided and fixed in a prominent position on the premises in which meters have been fixed, indicating the hours the establishment is open, and that motor vehicles may be charged up with gas.

Standard Pipe Fittings for Motor Vehicles.—Gas undertakings joining in this scheme should advise all vehicle owners (and insist if necessary), to fit up their gas-containers with the female end of the 2-in. bayonet-joint coupling previously recommended. A drawing of a vehicle fitted up in the way advised should be made, and a line block made from it. This block should be reproduced in the booklet referred to and in the Motor Press, together with a copy of working instructions and advice as to how the best results from the use of coal gas may be obtained.

Signed on behalf of the Committee,
W. Whatmough, President.
G. S. Frith, Hon. Sec.

Oct. 12, 1917.

DISCUSSION.

The President (Mr. W. Whatmough, of Heywood) said in this respect the gas industry was really now supplying a national need; and the Committee of the Institution thought it would be better if arrangements could be made for the standardization of fittings and organization, so that they could link-up the surrounding districts. They therefore appointed a Special Sub-Committee to go into the matter; and the result was the scheme before them. Mr. Barrett, of the Manchester Corporation, had been of great assistance to them; and he would ask him to introduce the matter.

Mr. W. M. Barrett (Manchester) said they would all realize at once the absolute necessity of securing the standardization of filling arrangements. On the previous day he had driven a motor 25 miles out and 25 miles back; and during this time 45 minutes were spent in charging it up with gas. This was only caused by non-standardization of fittings, either on the car or in regard to the meter connections. In his opinion, the regulations now proposed were quite feasible; and if they were adopted universally, it would mean, instead of taking from 15 to 25 minutes to charge, as was now the case, the same work could be done in five or six minutes, which would be a necessity if coal gas for motor traction was to be generally adopted. Specimens of the fittings which it was proposed should be used were in the room for inspection.

Mr. John West (Southport) said that, speaking from the point of view of a motorist driving a car or commercial vehicle for which gas for driving might be profitably employed, he considered that it was an absolute necessity, if this important business was to succeed, that some special facilities should be given by the gas industry throughout the United Kingdom. The project for gas supply to motor vehicles should be a very profitable business, if promptly handled in a practical and businesslike manner. For this purpose, it was necessary that gas undertakings should appoint a strong committee of management throughout the country. This committee should be composed not only of those who were responsible for the gas supply, but also of those who were responsible for the manufacture and use of the cars. It was necessary that a sufficient number of standpipes of large size should be fixed on all main roads throughout the kingdom, in order that the motorist should be able to obtain his supply conveniently and quickly. All connections for coupling-up to the cars should be of standard size; and the couplings should be of a quick-action type, and of one standard design. As regarded the measuring of the gas, he was strongly of opinion that meters were unnecessary and objectionable at the filling stations, not only on account of the initial cost, but also because of the possible reduction in pressure caused by passing the gas through them, and consequent loss of time in filling. All attention costs in connection with the standpipes should be dispensed with. The necessity for personal attention on behalf of the gas undertakings could be overcome by some system of discs or other tokens to be inserted in a slot before making the connection. After the connection was made, the disc would lock the supply. These discs or tokens could be obtained from the gas undertakings, garages, hotels, or shopkeepers. In connection with a scheme of this sort, the bags or containers should be certified as to their holding capacity, and the discs be supplied to correspond. In Southport, gas was being supplied to motors from the high-pressure mains, without passing through a meter; the charge being made upon the capacity of the gas-bag. It might be found advisable to arrange for the containers to be certified for capacity under the Weights and Measures Act. Such a scheme he believed would be practicable and simple; and in this opinion he was supported by Mr. John Bond. The high-pressure gas supply at Southport enabled the largest container to be filled from the main in five minutes. Therefore the saving in time by this project would be valuable. For private cars, gas at a high pressure might be conveniently stored in metallic or strong flexible bags. To do this, it would be necessary to instal a gas-compressor at each of the filling stations and in garages. He was now installing in his own garage a gas-engine driven compressor to compress the gas up to 50 atmospheres. Thus 600 c.ft. of gas could be stored in a cylinder fixed on the car. By this means, he would carry the gas supply in a container of moderate weight, and calculated that he would be able to travel 50 miles without requiring another supply. The only question that had to be solved was whether gas undertakings or others would be prepared to put down similar plants, so that motor cars fitted for gas at high pressure could be conveniently supplied *en route.* He proposed that the cylinders on his car should be certified as to capacity and gauge pressure. In this case, as in the case of supplies under ordinary pressures, he thought that the charging of a flat-rate would be most convenient for all concerned. For the efficient supply of the motorist's requirements, whether for private or commercial cars, it was necessary that gas undertakings should go into this question thoroughly, and be prepared to lay out some capital, bearing in mind that it was no use starting on this project unless a clear understanding was arrived at between all parties concerned, and that action should be taken simultaneously all over the country. He was sure there was a good prospect of commercial success in the supply of gas to motor vehicles.

Mr. H. Kendrick (Stretford) remarked that there were at the present moment such questions as labour troubles and coal supplies, in addition to the problems involved in providing further carbonizing plant. The British Commercial Gas Association had been asking for information as to whether at the present moment this addition to the existing output would be welcomed. He replied: "I should welcome it for nine months of the year, but at the present moment would rather be without it." With regard to the scheme now before them, he believed that for the present at all events it would be necessary to put down meters. The suggestion that slot meters should be used was debated by the Committee, and received practically no support at all. Carrying tokens about was rather difficult, because there was not yet a standard price all over the country; and it would be hard to fix on one that would be equitable to all undertakings. The tokens, in order to operate valves of 2 and 3 in. diameter, would have to be very heavy; and also they had heard of pieces of metal being put into slot meters instead of coins. He did not suppose motor-car drivers were any more honest than the average slot-meter gas consumer; and they might be tempted to drop in iron washers, with little fear of being caught. The size of the meter was fixed because it was recognized that time was an essential part of the contract. The reduction of the 3-in. connections to 2 in. by means of the flexible hose with bayonet-joint coupling would obviate the over-working of the meter and add very much to its longevity. It was recognized that some undertakings might want to supply without meters; and a suggestion was made to meet this. With regard to compressing machinery, he did not think this was a practical matter at present. He had the report of the

British Commercial Gas Association on "Gas for Motor Traction;" and this stated that the cost of a compressor only, without any engine, reservoir, and that kind of thing, would be in the neighbourhood of £400, based on pre-war rates—even if they were able to get it. So it was likely to be a very considerable item of cost, which very few undertakings would be prepared to incur now. Messrs. Braddocks had sent him a sketch of such a meter as was indicated. It had the additional dial and also the 3-in. connections, and was designed to pass 1500 c.ft. per hour at 2 in. pressure. A point had cropped up in conversation as to whether it was legal to sell gas through a second party. He had been referred to the Gas-Works Clauses Act of 1847; but he had gone through the two Acts without finding anything that would bear this construction. Section 6 of the 1847 Act gave them power to break-up streets and do what was necessary for supplying gas to the inhabitants of the district within the limits of supply. Section 13 said they might contract with any person for lighting or supplying with gas any public or private building. He took it a garage was a private building; and if they liked to make the garage proprietor their agent, they were within their rights. Section 11 of the 1871 Act said that they should give a supply of gas to any premises within 25 yards of the main, subject to certain conditions. He did not think this either was against the suggestion that they could use the garage proprietors as agents; and unless any Private Acts contained special clauses, he did not think they would be outside their rights in giving supplies.

Mr. H. TOWNSEND (Wakefield) said that, not knowing about this Committee, he had been working on his own account. It seemed to him that the size of fitting now recommended was too small. The essence of the business was speed; and he did not reduce below 3 in. He had managed the matter in a very simple way indeed, with practically no metal connected with the job. They brought the 3-in. pipe within about an inch of the pavement, and put a street-box over it. Before fixing it, they filed it down so that it was slightly tapered. Then they took the inner tube of an ordinary pneumatic tyre, which just slipped over the 3-in. pipe. Next they had a tin sleeve made to fit tightly inside this tube, and the other end of the sleeve went into the tube on the container. Then they cut a piece of their tube off, about an inch wide, and simply slipped it over the container tube, turned the valve on, and filled the bag. A 200 c.ft. container was filled in two minutes. There were no metallic connections fixed to the container; and with the fragile things now on the market, this was a matter of great importance. Any complicated arrangements for charging for the gas should be avoided. He greatly approved of the suggestion to have the capacity of the container painted on the outside. If they had a fixed price, which included service and everything else, and the capacity painted on the bag, it should be fairly easy to work the scheme.

Mr. J. P. LEATHER (Burnley) remarked that when they were filling at the gas-works they could adopt any system they liked; but the great point about these regulations was the filling at other points. He did not see exactly how Mr. West's idea of doing without attendants was to be carried into practice; and it seemed far more likely that they would utilize existing garages as places where the gas could be measured, and a proper charge made. The possible 6d. was a maximum charge above the ordinary price, to allow the garage proprietor to get something out of it. This man would be to a certain extent responsible, and must have a little commission on the business; but they must have an arrangement for limiting what the garage proprietor's price should be. As to supplying gas under pressure, the great difficulty now was to obtain compressors; but the Government strongly desired petrol to be economized, and so might grant them special facilities for getting hold of compressing plant. He had made inquiries in his own town as to the quantity of petrol used; and found that if the whole of it was displaced by gas, they would need to make about 60 million c.ft. more gas per annum, which would be an increase of 7 or 8 p.ct. on the output. But they could not possibly displace all the petrol simply by gas-containers at ordinary pressure—motor power-wagons for tramways were a case in point. He did not believe a compressor would cost the figure Mr. Kendrick had named. He thought the reference in the report was to pressures found in oxygen cylinders. Surely, a compressor to compress gas to 50 or 60 atmospheres need not cost £400. Could anyone say whether it was possible to procure such apparatus?

Mr. WEST said he had made inquiries, and there were difficulties in the way of getting them at the present time; but he was going to make one himself. If they let this business get too much into the hands of garages, these people might put electric motors in, if they had the chance. They should keep the thing to themselves as far as possible, and act promptly.

Mr. J. H. BREARLEY (Longwood) said that probably there would be a difficulty now in regard to getting compressors; but if this business was going to be a permanency, as most of them were agreed was the case, the British Commercial Gas Association might consider standardizing even compressors, and place an order for a hundred. They would then be able to get them from the Association much more cheaply than by buying them individually. In fixing a meter in a garage with a 3-in. outlet, they must not forget the size of the main which it was going to draw its gas from. ["Hear, hear."] The suitable location of the filling stations from this point of view was a very important matter to keep in mind. The Committee did not appear to have regarded it.

Mr. KENDRICK: It was discussed.

Mr. BREARLEY suggested that the standardizing of the cylinders should also be considered by the British Commercial Gas Association or the Government.

Mr. S. MEUNIER (Stockport) said the point raised by Mr. Brearley as to the filling stations and the mains was met by the suggestion as to arranging the position in consultation. He took it that the engineer himself would be very careful to see that the gas supply to the ordinary consumers was not interfered with. The scheme was one which must be carried out all over the country; and if the British Commercial Gas Association took it up, they could ask other districts to do the same as it was proposed to do in Manchester. Compressors could not be obtained now; and they must get going at once with the facilities at command. If they could get the filling stations arranged for, a good start could be made; and further proposals must wait for the future. When the time came, the gas profession would not be behind in doing all that was required to meet this demand.

Mr. FRANKLIN THORP (Manchester) urged that a good case could be made out for the token. It had many advantages; and the main disadvantage could be done away with, if they adopted a system something like the Yale Lock key. He had a little token of the shape of a coin, but having on it serrations, so that it must pass through a correspondingly serrated slot. This would do away with the idea of boys putting anything in. The cost of making this special token would be more than it was worth to the man who was only going to get 4d. worth of gas for it. Therefore he would not attempt to make one himself. The tokens would be universal, and have different values. Mr. West had referred to the cost of meters. He had had the sanction of the City Justices to a "Rotary" meter which would be rather different from that the members had always known. They wanted a meter that was accurate, so that it could be stamped, and which, when the filling with gas was finished, should close-down suddenly. Special precaution should be taken so that any gas not removed by the customer should be returned to the supplier; and the meter should be small, cheap, and practically indestructible. The new "Rotary" meter would answer these requirements. The disconnecting of the gas-bag would close the valve; so that any gas left over (the container might have been not quite empty or not quite filled) would go to the supplier. A little meter to pass 1500 to 2000 c.ft. an hour was only about 12 in. square, and would cost no more than £10 or £12.

It was agreed that the scheme, which was adopted, should be forwarded to the British Commercial Gas Association.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Railway Companies and the Gas Industry.

[Owing to the letter on this subject in last week's "JOURNAL" arriving just before the "JOURNAL" was sent to press (see p. 181), space could not then be found for the following editorial note.]

"*Audi Alteram Partem.*" Certainly. But it happens that our correspondent is not a railway man, but a gas man. However, his letter is interesting as an excellent illustration of the habit of human nature to regard matters from the individual point of view. The strong man has his point of view; the man in a less influential position has his point of view. The gas undertakings—possibly a hundred, even more—that have an extensive selling business with railway companies may have theirs; the gas undertakings with a less extensive business—possibly 1500 or so—may have their own. It is not suggested by us that the relations between gas undertakings and railway companies are bad. But what is complained of is that there appears to have lately been a decided outbreak—co-operatively, in union, or whatever other expression satisfactorily meets the case—on the part of the railway companies to secure preferential consideration for themselves. We cannot, however, bring ourselves to think that they are so thin-skinned that a little criticism would affect friendly relations with the gas industry, particularly in view of the considerable reciprocal custom. Friendly relations might receive expression in acts as well as in words. "*Audi Alteram Partem*" claims to have an intimate knowledge of the facts. We reflect on Parliamentary Committee-Room work, certain voluminous contributions to Private Gas Acts, many a talk with gas engineers in the provinces as to irritating experiences in the matter of the railway service to their works and of negotiations in connection with the laying and extension of sidings. Intimate knowledge of facts has certain bounds; and location and position may cause a very wide difference in knowledge of the "facts" and in points of view. Our correspondent objected to the use of the word "collusion," simply because he puts upon it the popular dictionary meaning of "secret co-operation for fraudulent purposes," instead of recognizing that to act collusively also means to act in concert, and not necessarily with fraudulent intention. The use of the word in relation to the matters specifically mentioned in our article will not, by any stretch of the most lively imagination, allow of fraudulent intention being inferred.

There is not the slightest objection on our part to railway companies or anyone else carrying out all possible investigation into lighting efficiencies, and the effects of various conditions upon these efficiencies. But when the Board of Trade has determined, after a patient hearing, that 15-10ths is a fair minimum pressure, the railway companies might have been satisfied, instead of going to Parliament, and asking for preferential treatment as to 20-10ths. This will not make any difference in some areas; it might make a considerable difference in some country districts. One of the companies that have secured the 2 ins. minimum pressure, governs-down the supply to something less at the other side of the meter at one of its stations! As to gas quality and the presence of avoidable incombustibles, we think that the part taken by the "JOURNAL" in this matter is sufficient proof of our sincerity for reformation in this respect. Relating to it, we do not remember that anyone has suggested that "it is for the whole industry to espouse the cause of a few gas undertakings that understand their business so ill that they do nothing to supply what their customers need, but rather to sell what they choose to make, at such a pressure as they choose to give."

There is the question of gas account payment. Admittedly the railway companies are large customers of the industry, and very considerable ones of some gas undertakings. The large gas undertakings are just the ones that can give six months' credit without feeling it. There may well be a hundred gas undertakings that have readily acceded to the request. But the railway companies being such "good friends" should have some consideration for those smaller undertakings of

which they are "in many cases large (and in some cases the largest) customers." The very fact that they are the largest consumers (and, as a rule, get special terms) is all the more reason why they should pay up more promptly than at six-monthly intervals, seeing that the smaller gas undertakings, which have to pay for their materials and labour as they go along, can ill-afford to give such long credit. The railway companies are paid by their passengers as they travel; for their goods traffic they demand and insist upon getting short-period settlement. Such good and promptly paid friends might be considerate, though, of course, those gas undertakings that can afford to give them six months' credit can do as they like. If the plan of six-monthly payments was designed solely for the purpose of minimizing work in war time, then most of the smaller gas undertakings would willingly rather attend to the making out of the single account and get the money than be without it. It would perhaps minimize work in war time if the London gas companies only sent out their accounts to the ordinary consumers once in six months, though perhaps it would not be so good for the companies' general financial health.

Really "*Audi Alteram Partem*" there is no question of quarrelling; it is only a matter of asking certain good friends to look upon these matters justly, and not only from their individual standpoint and convenience. By the way, Mr. H. E. Jones referred to the activity of the railway companies at the meeting of the Gas Companies' Protection Association last Thursday, and not exactly in the same terms as our correspondent.

Sliding-Scale Injustice.

SIR,—I should regret arriving at cross purposes with Mr. Valon. We appear to be in almost entire agreement; and it would be a pity to differ on verbal distinctions.

The whole subject is fraught with such important issues concerning the industry's welfare, as well as its internal harmonious working, that mere argument serves no useful purpose.

The question is *sub judice;* but it is hoped that opportunity will be afforded later to continue, if necessary, strong protest against an inequitable condition of affairs, due to the passing of time.

EDWIN UPTON.

Liverpool, Oct. 27, 1917.

The Sliding-Scale.

SIR,—I have refrained from entering into a public controversy on this question, because of the action by the National Gas Council, which represents the voice of the industry. Now that we have got so far, individual opinions on the principles of the sliding-scale should remain in abeyance; otherwise, if the truce is not maintained, some pronounced views from divergent schools of thought must be analyzed, and may not advance, but possibly confuse, the examination of the question now at issue, which is wartime relief.

It is admitted by those who have studied the problem, that there are outstanding cases of peculiar hardship, and friends of those feel that, whatever may be the result of the joint action now *in transitu*, such undertakings have a door open for redress, by individual application to Parliament, which would seem in any case their natural and primary course.

R. W. EDWARDS.

Aldershot, Oct. 26, 1917.

The Destination of the Miners' Increase.

SIR,—Is there any sound reason why the Government should permit the increased cost of coal winning conceded by them to the miner to be passed on to the user that is not equally applicable to the increased costs of the products of carbonization of such coals? If there is, it would be interesting to know it. If not, it would appear, *ipso facto*, to be patriotic for the coal owner to be enabled by authority to pass on his extra costs. It should be the same for the gas industry.

Perhaps the more robust patriotism of the coal owner and the coal miner develops a sturdier physique and a stronger attitude towards difficulties than the feebler patriotism of gas men.

J. KELLY.

Bridlington, Oct. 26, 1917.

Gaseous Fuel.

SIR,—I have read with great interest the article entitled "Gas-Pipe Lines *v.* Electric-Pole Lines" in the "JOURNAL" for Oct. 23.

I see Mr. Helps contends that the best practice would be to carbonize coal at the pit's mouth, and distribute the coal gas produced through high-pressure pipe-lines to the towns where it is required, and then raise steam with it for the production of electricity.

Supplying coal gas obtained through carbonizing coal at the pit's mouth is doubtless a sound policy for towns near the coalfields, and is already being carried out at Middlesbrough and other towns. But I think that this course has its geographical limitations; and another method promises a greater chance of success in other districts. I also think that using coal gas for raising steam is a very wasteful method of producing energy.

In a paper, under the title "Gaseous Fuel," read in 1885 before the Gas Institute, I gave details of an experiment which was carried out for the express purpose of throwing light on the question of raising steam by means of gaseous fuel. This test proved that coal gas of over 600 B.Th.U. calorific power would have to be sold at about 2¼d. per 1000 c.ft. to compete with coals for firing boilers—a manifest impossibility. And, although the cost of coals to-day is, of course, much more than it was in 1885, the cost of producing coal gas has gone up in the same proportion, so that the comparative result is the same.

In the paper named, and in a series of letters contributed to the "JOURNAL" in 1884, I advocated the conversion into water gas of the coke produced at the gas-works with which I was then connected, and the delivery of the gas through a short separate system of mains in certain districts abounding in factories. I showed that it could have been sold there at a profit, at 6d. per 1000 c.ft., and then turned into power through suitable large gas-engines; and I still think this is a sound proposition in certain localities.

At a recent meeting in Manchester, Mr. Shrapnel-Smith (on behalf of the Government), speaking on the subject of "Coal Gas for Motors," is reported to have said: "He did not wish to throw a bomb amongst gas engineers, but he wished to say this: If the London General Omnibus Company should go wholly on gas, by degrees of course, it would mean an extra load of 28 million c.ft. a week. If the gas companies did not take this load, the big consumers would set up their own gas-works," &c.

This 28 millions per week would be necessary for the requirements of the London General Omnibus Company alone. Now how is this demand to be met? I see the London Gas Companies in 1916 had about 2,290,000 tons of coke for sale. Taking 50,000 c.ft. as a fair production of water gas per ton of coke, we get 114,500 million c.ft. per annum, or 2202 millions per week. So that the coke available, even after retaining supplies for other indispensable services, if converted into blue water gas could easily satisfy the requirements of the London General Omnibus Company, and leave a large surplus for supplying other London motor vehicles. This blue water gas could be added to the coal gas at the various Metropolitan Gas-Works in such proportions as were found necessary to meet the increased demand caused by the new requirements, and could be supplied to the motor vehicles wherever it was found most convenient.

This method of meeting the demand for gas for power purposes seems to me more feasible for places like London than conveying coal gas made at the pit's mouth through pipe lines perhaps hundreds of miles long; and this gas could be sold (even in these difficult war times) at such a price as would make it only one-quarter the price of petrol for motor vehicles.

It would greatly facilitate this course if the Government would abolish altogether the out-of-date standard of illuminating power and lower the standard of calorific power to 400 B.Th.U. gross, or better still abolish standards altogether, and leave gas undertakings to supply gas to the satisfaction of their customers, without which they would soon cease to exist. None of the other public utility services (such as electricity, water, or sanitation) have any standards. Why should the gas industry be handicapped with them?

Similar arrangements for supplementing the coal gas supply throughout most of the rest of the country would be the likeliest means of realizing Mr. Shrapnel-Smith's ideal of a "home-produced fuel, and above all one which distributed itself."

H. TOWNSEND.

Wakefield, Oct. 25, 1917.

Paid Holidays for Workmen.

Following upon the advocacy by Sir Robert Hadfield, Bart., in an interview appearing in the columns of the "Observer," of paid holidays for workmen, our contemporary publishes a statement by Mr. D. Milne Watson regarding the practice prevailing in the case of the Gas Light and Coke Company. The Company, he says, give on the completion of eight weeks' service, but less than twelve months, one day's holiday, with pay, for each eight weeks. On the completion of twelve months' consecutive service, the man gets a week's holiday with pay; and on the completion of three years he is given a week's holiday with double pay. If, therefore, a man is getting 40s. a week, he is able to take away for his holiday 80s., which is a very liberal concession. The man needs a change; and it enables him to take it without a strain on his resources. Often it may happen when a man receives only his single pay that he has to stay at home, which is not so good for him. He finds it difficult to keep up his house, and probably have some members of the family staying at home, and at the same time to go away for a holiday himself, with all the cost of railway fares, holiday apartments, and so on. But the double pay helps him to do it comfortably; and he returns to work refreshed by the change.

Price of Gas in Berlin.—The Corporation of Berlin have increased the price of gas to consumers, as from Sept. 1 last, from 4s. 6d. to 5s. 8d. per 1000 c.ft., except in the case of slot-meter users and small consumers who do not use more than 35 c.ft. per diem. To these classes, the price will be 5s. 1d. per 1000 c.ft. It is explained that the increase is due to the general growth of expenditure in respect of coal, coal-tax, freight, way-bill stamps, wages, &c., which make up a total increase in expenses for the current financial year of over £460,000.

Calorific Power at Brentford.—The Heston and Isleworth Urban District Council have received a letter from the Brentford Gas Company, replying to the Council's complaint in regard to the low calorific value of gas now supplied to consumers. The Company point out that there has been no relaxation of the demands made by the Ministry of Munitions on the resources of the Company, but that, on the contrary, the need for gas-works products in the prosecution of the war has become more and more acute. While the Company have no desire to depart from their statutory obligations, it is quite impossible to fulfil them under the conditions which now exist. The Company also call attention to the fact that, for the first eighteen months of war, no increase was made in the price of gas; and that it was not until 2½ years had expired that they were compelled to fall into line with their neighbours, who had increased prices at a much earlier date. In reporting this letter to the Council, the General Purposes Committee state that, while appreciating the difficulties with which the Company have to contend at the present time, they are still of opinion that there is much need for improvement in the supply afforded to the district, and they have accordingly directed that a further letter be sent to the Company to this effect.

REGISTER OF PATENTS.

Gas-Lighting Appliances.—No. 109,065.

IDIENS, J., of Margate, and IDIENS, G., of Croydon.

No. 9788; Jan. 12, 1917.

This invention has for its chief object to enable gas-jets to be more conveniently lighted—especially where they cannot be reached without the use of a ladder—as, for example, in halls, schools, churches, factories, outside shops, &c. The appliance can also be adapted for the turning on and off of gas-taps.

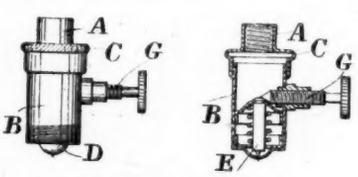
The igniter is of the type in which a sparking-rod is operated by a knob and works within a barrel under the control of a spring arranged between abutments fixed to the sparking rod and barrel respectively—the end of the sparking-rod engaging a sparking medium and being fashioned so as to produce the required igniting sparks when the sparking-rod is operated. The sparking-rod is arranged to be retracted against the pressure of the spring by means of a knob fixed directly to it, and the shank of which works in a longitudinal slot in the barrel. The whole arrangement is such that, when the sparking-rod is suddenly released, its sparking-end moves rapidly forward in contact with the sparking medium and causes the required sparks to be produced.

Gas-Burner Valve.—No. 109,741.

GOULD, F. J., of Little Trinity Lane, E.C.

No. 3306; March 6, 1917.

This gas-burner valve is of the type in which a spring-controlled needle is moved against the pressure of its spring by the tapered point of a screw.



Gould's Gas-Burner Valve.

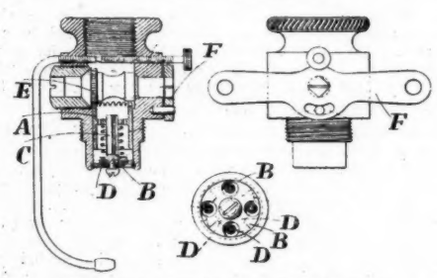
The valve comprises two main parts A B (of sheet metal) superposed—the lower screwing into the upper, which has pressed out of it a rib or equivalent projections C. The upper part is screw-threaded, and the lower part, carrying the needle, has the screw fitted to it at right angles to the spring-controlled needle E. The tapered end of the screw G acts on the upper end of the needle, and forces the pointed end out of an opening in the otherwise closed end of the lower part.

Bunsen Burners.—No. 109,758.

M'LACHLAN, R. W., of Enfield Highway.

No. 7048; May 16, 1917.

This invention has particular reference to burners used with incandescent mantles. The burner is of the type wherein the discharge of gas-mixture takes place from the nipple through a perforated plate covered with a movable plate for controlling the discharge through the perforations—characterized by the plate being so shaped as to present a covering edge for each perforation (preferably convex at the part which co-operates with the perforation), the covering edges being so arranged that they can all be simultaneously brought into operation with their respective perforations.



M'Lachlan's ncandescent Mantle Burner.

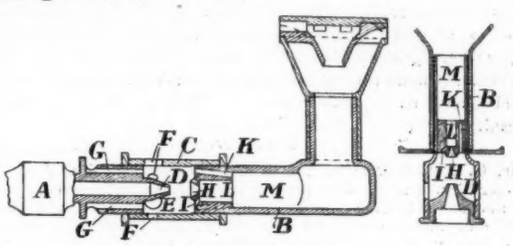
The operation of the device shown is: When the operating-member F is moved to the limit of its travel in one direction, the cams on the plate D are moved to cover the perforations in the plate B, so that no gas can escape; and when it is moved to the limit of its travel in the other direction, the cams are carried to a position where they are practically free of the perforations. Thus the full volume of gas is allowed to pass through. The operation of the member F turns the pinion E, which correspondingly partially rotates the sleeve A, and this, by its squared engagement with the squared spindle C, rotates the multi-cam member D, which is carried on the small square at the end of the spindle—the point of the screw serving as a pivot for the lower end of the spindle. When the operating-member F is put in an intermediate position (such as that shown), the cams partially cover the orifices, so that the flow of gas through the perforations is checked to a nicety by setting the controlling-member at any desired position between the two extremes of its travel. It is found that the thickness of the moving plate D prevents the streams of gas from coming out from the perforations perpendicularly to the plate; and to counterbalance this (or modify the degree of obliquity of the jets), the edges of the perforations are bevelled on the outer side as shown.

Bunsen Burner.—No. 109,745.

WALKER, O., of Zürich, and JÄGGLI, H., of Oerlikon, Switzerland.

No. 4061; March 20, 1917. Convention date Jan. 15, 1917.

The illustrations show two examples of the invention—a longitudinal section through a heating burner, and a vertical section through the mixing tube of an Auer burner.



Walker and Jäggli's Bunsen-Burners.

In the heating burner, the gas supply pipe A is connected with the mixing-tube B through a sleeve C screwed internally. There is thus formed between the gas-nipple D and the mixing-tube an air-suction space E. The air supply is effected not only through side openings F in the sleeve, but also through the axial inlets G arranged in the head of the nipple concentrically around it, whereby air is aspirated in the direction of the gas current flowing out of the nipple—an arrangement of air supply which has "proved to be advantageous."

Opposite the head of the duct there is the mixing device for the gas and the combustion air. This consists of a mixing-tube, with a relatively narrow, funnel-shaped central orifice H, behind which the mixing-tube is enlarged in successive steps. Around the central orifice are arranged further inlets I K, of which the former discharge into the narrower part L, while this latter enters the wider part M of the mixing-tube in an inclined direction.

In consequence of this arrangement, "the central current of gas is encountered at various distances from the orifice by inclined air currents; so that, in consequence of the eddies caused by the sudden sectional increases in diameter, an intimate mixture is obtained of the gas with the air, whereby a practically complete combustion at the burner crown and a high degree of heat are obtained.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Oct. 24.]

Nos. 14,870—15,273.

BARNETT, J. H.—"Gas-containers for motor vehicles." No. 15,037.

BARTON, T. H.—"Safety-valves or release appliances for low-pressure gas or fluid containers, &c." No. 15,168.

BLAKOE, R.—"Means of controlling and retaining gas-bags, &c., the same being used to act as a compressor." No. 15,041.

BRADLEY, A.—"Continuous conveyor retort for distillation, carbonization, roasting, &c., of coal, &c." No. 15,134.

BRAYSHAW, E. R. & S. N.—"Furnaces." No. 14,963.

BROWN, L.—"Gas-containers for motor vehicles." No. 15,258.

BUTTERWORTH, T. S.—"Gas-storage tanks or cylinders." No. 15,007.

ETCHELLS, H.—"Coal-gas generating appliances for vehicles propelled by internal-combustion engines." No. 14,952.

FEAST, C. C.—"Gas-mixing chamber for internal-combustion engines." No. 15,131.

GOVER, H. C.—"Apparatus for moistening and treating air in connection with a gas, &c., stove." No. 15,004.

GREAVES, H. A.—See Etchells. No. 14,952.

HARGER, J.—"Manufacturing fuel gases." No. 15,237.

HARRIS, H. J.—See Feast. No. 15,131.

HELPS, G.—See Harger. No. 15,237.

HOLOPHANE, LTD. (Holophane Glass Company).—"Glassware for illuminating purposes." No. 15,272.

KEITH, G. & J.—"Apparatus for maintaining proportional delivery of fluids." No. 15,253.

KEITH, G. & J.—"Crucible furnaces." No. 15,254.

KNAPE, J.—"Collapsible gas-containers for motor vehicles." No. 15,029.

LAMPLOUGH, F.—"Coal-distilling apparatus." No. 14,997.

LAVARELLO, P.—"Apparatus for regulating fluid and gas pressure between gas meter and burners, &c." No. 15,153.

MACINTOSH & CO., C.—See Brown. No. 15,258.

M'LUSKY, W. B.—"Gas-fires." No. 15,062.

M'LUSKY, W. B.—"Burners for gas, &c., fires." No. 15,063.

MASON, G.—"Gas-containers." No. 15,030.

MURPHY, T.—See Mason. No. 15,030.

OIL-EXTRACTORS, LTD.—See Lamplough. No. 14,997.

PHILLIPS, A.—"Means for carrying gas upon motor vehicles." Nos. 14,874, 15,256.

RICHARDSON, C. J.—"Taps or cocks." No. 15,217.

ROGERS, A.—"Method of use of coal gas, &c., as a source of power." No. 14,964.

SMITH, D. J.—"Suction-gas plants." No. 15,089.

THORP, F. & H. T.—"Prepayment gas-meters." No. 15,028.

UNER, C. O.—"Gas-containers for motor vehicles." No. 15,259.

WATSON, R. S. B.—"Portable compressed-gas container." No. 14,942.

YATES, H. J.—"Furnaces." No. 14,963.

PARLIAMENTARY INTELLIGENCE.

COAL MINES CONTROL AGREEMENT (CONFIRMATION) BILL.

The text has been published of a Bill (presented by Sir Albert Stanley) "to confirm and give effect to a certain agreement relating to the compensation to be paid in respect of the control of coal mines, and other matters arising out of such control." The agreement referred to, which is set out in a schedule to the Bill, is dated July 20, 1917, and is signed by Mr. Guy Calthrop (Controller of Coal Mines), Mr. Adam Nimmo (the President of the Mining Association of Great Britain), and Mr. Reginald Guthrie (the Secretary of the Consultative Committee).

Fertilizers.

Mr. G. Lambert asked the President of the Board of Agriculture whether he was aware that there was an acute shortage of basic slag, and that sulphate of ammonia supplies were uncertain; and whether supplies of manures could be reasonably assured before farmers were asked largely to extend tillage operations, the fruitfulness of which depends on fertilizers.

Sir R. Winfrey, in replying, said the output of basic slag during the year ending May 31, 1918, would amount to at least 500,000 tons, as compared with something under 400,000 tons in the preceding season. In addition, certain accumulations of low-grade slag which had not hitherto been regarded as sufficiently valuable to be used would be ground for use if required. The supply of sulphate of ammonia for agricultural purposes was likely to amount to 190,000 tons during the present season, as against 150,000 tons last year. In the case of both these fertilizers, therefore, provision had been made to meet increased demands from farmers, and all possible steps were being taken to extend the output. The importance of increasing the output of fertilizers was fully recognized, and the Board were in constant communication with the Ministry of Munitions on the subject.

Mr. Flavin asked whether low-grade slag contained only 15 to 20 p.ct. of soluble phosphates, and was practically useless for agricultural purposes.

Sir R. Winfrey said it was not useless, but not so useful.

Sir C. Henry asked whether it was the intention of the Government to fix the price of these articles.

Sir R. Winfrey replied that they were trying to keep down the prices.

Brentford Gas Company's Charges.

Mr. W. Thorne asked the President of the Board of Trade whether he was aware that the Brentford Gas Company had recently raised the price of gas to 4s. 2d. per 1000 c.ft., and whether he would consider the advisability of taking action, legislatively or otherwise, to secure the supply of gas at a reasonable price to consumers?

Mr. Wardle, in reply, said he was informed by the Company that the price which they charge for gas is 3s. 4d. per 1000 c.ft.; but an additional 10d. is charged to prepayment consumers to cover the cost of the meter and fittings—the additional charge being less than the actual cost to the Company. The sliding-scale of price and dividend under which the Company work makes it their interest to keep the price of gas as low as possible, by reason of the provision that when the price is increased the dividend must be correspondingly reduced.

Coal Raised during 1916.

Mr. W. Thorne asked the total number of tons of coal turned out of the various collieries in the United Kingdom for the years 1916 and 1917.

Mr. Wardle replied that during the year 1916 the quantity raised at coal mines in the United Kingdom was 256,348,351 tons. For the first nine months of the present year, the output was, approximately, 187,750,000 tons, or 5,000,000 tons less than in the corresponding period of 1916; the areas principally affected by the decrease being the exporting districts.

LEGAL INTELLIGENCE.

KOPPERS' COKE-OVEN PATENTS.

After many months of delay, the application for a licence to use the German patents which cover the Koppers coke-ovens and recovery plant was heard in the Patents Court on Wednesday last by the Controller (Mr. Temple Franks, C.B.) and the Deputy-Controller (Sir Cornelius Dalton, K.C.M.G., C.B.).

The delay had occurred through the proceedings set up by Mr. Derry, who opposed the application, to challenge in the Chancery and Appeal Courts the jurisdiction of the Patents Court. The application was that of Messrs. Simon Carves, Ltd., of Manchester, for a licence to use the two Koppers coke-oven patents No. 20,870, of 1904, and No. 16,386, of 1905.

Mr. Hunter Gray appeared for the applicants; Mr. Henry Terrell, K.C., and Mr. Courtney Terrell represented the opponent, Mr. Albert Victor Derry, of the Koppers Coke-Oven and Bye-Products Company.

Mr. Hunter Gray, in making the long-deferred application, stated that the applicants were a firm of contractors and manufacturing engineers whose chief business was the erection of furnaces at collieries. They also for a time managed the processes involved, and in some cases had an agency for the sale of the products. They had sold £380,000 worth of products to the Government since the war began. The products were sulphate of ammonia, benzol, and tar. Applicants made, with the processes, ovens to separate the bye-products from the coal. They were not of opinion that these infringed the patents. However, it was urged, for the protection of their customers, that if they wished to make recovery plants at all, they should treat them as under the patents. The patents were for a process for the recovery of the ammonia and tar from the vapours which came off from the dry distillation of the coal; and the alleged invention consisted in recovering these in the most economical manner, by avoiding the condensation of the moisture. It arranged that the condensation of the tar should take place at a temperature above that at which the moisture took place. The people who used the plant might employ temperatures which would infringe the patents. So that it was essential that they either gave them an indemnity or else had a licence to work the process. It was a question of temperature largely. The opponents had threatened infringement. From 1905 to 1916 there was a series of threats issued by Koppers (in letters to their customers) that they were infringing Koppers' patents. Because of this continual persecution by the Koppers' firm they desired to be protected. It was not that they attached any value to the patents; they wanted the licence to protect their clients. The royalty they proposed was on the basis of £1 per oven which supplied the vapours to the patented parts. There might be 25 ovens to a plant.

Mr. *Edward Lloyd*, Manager of the applicant Company, observed that a 25-oven plant would cost £40,000. The only plant to which by any chance the patents could apply would cost £1000.

Counsel for Mr. Derry urged that if any particular client, by his method of using the plant, infringed the patent, he should be sued—not the makers. The makers did not want the licence to use the plant. The Court should not grant them any licence to cover somebody else's conduct.

Witness said that ammonia was used for high explosives, and pure ammonia was manufactured from sulphate of ammonia in considerable quantities for munition purposes.

Mr. *Derry* said he was Manager of his Company under the Controller appointed by the Board of Trade. The firm now employed 500 hands. He could execute all the orders that were going. He insisted that it was wrong for anybody to represent that ammonia was made in quantity from ammonia sulphate.

On this point, Mr. *W. Greaves*, F.I.C., Lecturer on Bye-Product Coking at Leeds University, agreed with the latter part of the previous witness's statement. He asserted that sulphate of ammonia was not used for explosives. Certain bye-products obtained might be the basis of toluol and benzol.

Mr. Henry Terrell submitted that the opponents had the largest business of this kind in England before the war; and so long as they could supply all requirements, it was not in the interest of the public that a licence should be granted to anybody else. He suggested that Mr. Simon was not a German.

Mr. Hunter Gray said he was informed there was a Mr. Simon who was a German. His three sons, born in England, had been killed fighting for this country; and their Executors were Executors in this Company.

Mr. Terrell: The great bulk of the shares belong to the Simon Executors.

The Controller, in concluding the hearing, said Mr. Derry's partnership had been dissolved; and the Court did not know what the ultimate future of the Company would be. It was being worked by the Board of Trade. It was to be argued that the making of sulphate of ammonia should be generally promoted. Various points had been raised in the course of the hearing, and there was the question of royalty to consider. He would go into all the matters and make his report to the Board of Trade; and the applicants would be notified by the Board in due course as to their licence.

Disputed Gas Consumption.—At the Tavistock County Court, on the 20th inst., the Gunnislake Gas Company sued Louis Paul, a butcher, for 15s. 8d. for gas consumed and rent of meter. The defence was that there was a considerable difference in the charge for two quarters; and as the same quantity of gas had been used in each quarter, a mistake must have been made in the meter. His Honour Judge Lush-Wilson held that, if persons contracted to pay by meter, they must do so, even if the meter was wrong. Judgment was given for the Gas Company.

Responsibility for Gas Supplied.—At the Croydon County Court last Thursday week, before His Honour Judge Harington, Britbronze Ltd., of Carshalton, with Lindon E. Wooster, were jointly sued by the Croydon Gas Company for the sum of £29 17s. 4d. in respect of gas supplied, work done, and geyser and cooking stove hire. Mr. Robinson explained that the action was framed alternatively. In the first place, the Company were sued on the ground that the agreements were in their name, and the gas was supplied to their premises. When the demand was made on the Company for payment, it was alleged that this particular gas and stoves were all supplied, not to the Company, but to the Company's Secretary, Mr. Wooster, who was therefore added to the action. There was now no appearance; and in the absence of both defendants, it was necessary to go beyond the question of proof against the Company. The agreements in the name of the Company were signed by the Secretary. It was true that, *prima facie*, the secretary of a company had only such authority as was given to him; but Wooster signed other contracts to supply gas to other parts of the Company's premises in exactly the same way, and the bills had been paid by the Company. The Company appeared to have been registered some time in 1916. There were only two shareholders. Both were Directors; and one was also Managing-Director, and the other also Secretary. His Honour gave judgment for the Gas Company, with costs.

At a special meeting of the Batley Town Council last week, the audit of the municipal accounts was stated to have shown a deficiency on the gas accounts of £438.

MISCELLANEOUS NEWS.

GAS COMPANIES' PROTECTION ASSOCIATION.

The Twentieth Annual General Meeting of the Association was held last Thursday, at the Caxton Hall, Caxton Street, Westminster, S.W.—Mr. H. E. JONES presiding.

In addition to that of the Chairman, the following names appeared in the attendance-book: Mr. C. F. Botley (Hastings), Mr. G. H. S. Iorns (Ilford), Mr. R. W. Edwards (Aldershot), Mr. W. B. Farquhar (Ilford), Mr. L. Trewby (North Middlesex), Mr. D. Milne Watson (Gas Light and Coke Company), Mr. T. H. Hazell (Newport, Mon.), Mr. A. A. Johnston (Brentford), Mr. George Clarry (Cardiff), Mr. T. May (Richmond, Surrey), Mr. W. A. Scott (Ascot), Mr. H. T. Manwaring (United District Gas Company), and Mr. T. H. Duxbury (South Shields).

The SECRETARY (Mr. F. E. Cooper) read the notice convening the meeting and the minutes of the one held on Oct. 26 last year.

The minutes having been confirmed, the members agreed to take the annual report and accounts as read.

THE ANNUAL REPORT AND ACCOUNTS.

The Committee herewith present the revenue account and balance-sheet, together with a report of the proceedings of the Association for the year ended Sept. 30, 1917.

The expenditure amounted to £532 1s. 6d. The revenue was: Subscriptions and donations, £544 3s. 3d.; income-tax refunded, £45 10s. 9d.; interest on War Loan (less tax), £133 19s. 8d.—amounting together to £723 13s. 8d., and leaving a surplus of £191 12s. 2d.

The balance-sheet shows that the assets amount to £4640 2s. 7d., consisting of £4636 10s. 5d. of 5 per cent. War Loan (1929-1947), at cost £4404 14s. 5d.; balance at bank and cash in hand, £235 8s. 2d. From this total must be deducted the amount owing to the bankers—viz., £3075; leaving a balance in favour of the Association of £1565 2s 7d.

Since the date of the last annual accounts, the Association's holding of £3427 4s. 1d. in the 4½ per cent. War Loan has been converted into 5 per cent. War Loan (1929-1947). The Committee also applied for a further £1000 of the 5 per cent. War Loan, and obtained the necessary funds therefor from their bankers.

Since the preparation of the accounts, the Committee have reduced the amount owing on loan to the bankers by the sum of £150; and the amount now owing is, therefore, £2925.

The formation of the National Gas Council referred to in the last report has been carried into effect; and the following members of the Committee were appointed to represent the Committee on the Executive Committee of the Council—viz., Messrs. H. E. Jones, C. C. Carpenter, D.Sc., Douglas H. Helps, and A. A. Johnston. As will be seen from the accounts, the Committee subscribed £100 to the funds of the Council.

The Committee considered representations made by certain gas companies that steps should be taken to secure a temporary suspension of the sliding-scale during the war; but while recognizing the hardships of their position, the Committee felt that the question was one of extreme complexity, owing to the various conditions of the several companies, and that any attempt to alter by a comprehensive measure the sliding-scale positions of gas companies as a whole would not be practicable, as many companies object to such action.

The whole question as affecting also maximum dividend companies and municipal undertakings is being considered by a Committee specially formed for the purpose by the National Gas Council; and this Association is prepared to give every assistance and support to any feasible action which such Committee may recommend.

A matter of considerable importance which received the attention of the Committee was the attempt made by railway companies to impose on gas companies promoting Bills in the present session of Parliament provisions as to inert and incombustible gas. None of these attempts, however, were successful.

The Committee in July considered a communication from the Board of Trade as to the inquiry to be held by the Fuel Research Board with reference to the most suitable composition and quality of gas and minimum pressure at which it should be supplied, and requesting the Committee to appoint an expert to meet Sir G. T. Beilby, F.R.S., the Director of Fuel Research, at a preliminary conference; and the Chairman, Mr. H. E. Jones, was nominated as the Association's representative. In reply to an inquiry from the Fuel Research Board, they were informed that the Association would communicate further with Sir G. T. Beilby on the receipt of a report on the subject which is being prepared by a Special Committee of the Institution of Gas Engineers, to whom the matter has been referred.

The Committee also decided to watch the inquiry, and take such action with reference thereto as might be found necessary.

The following are the principal matters upon which the Secretary has been consulted during the past year: Applications for Orders under the Gas (Standard of Calorific Power) Act, 1916. Alteration of gas-mains by local authority under Public Health Act, 1875 (Section 153). Excess profits duty. Charges for street lighting in wartime. Loss of coal during transit on railway. Certification of gas-works under Munitions of War (Amendment) Act. Rebuilding retort-house (income-tax allowance). Income-tax allowance for useless buildings. Issue of capital (Treasury consent). Charges for electricity supplied by a municipal corporation. Duty on loan capital. Alterations to fittings in roads due to maintenance and variation in level of highway. Amendment of Sale of Gas Act, 1859. Recovery of gas-rent. Income-tax on subscriptions to Association. Liability for coins stolen from prepayment meter. Liability of gas company for damage to adjoining property by explosion at gas-works. Questions under Price of Coal (Limitation) Act, 1915. Form of agreement with prepayment meter consumer. Stamp duty on share transfer. Right of non-shareholder to be present at meetings. Calling in of mortgages during the war.

The total number of members of the Association is 137; two companies having joined and one member having withdrawn from the Association during the year.

The following members of Committee retire in accordance with Rule 9: Mr. Henry E. Jones (Commercial Gas Company), *Chairman*, Mr. Thomas Berridge (Leamington Priors Gas Company), Mr. Charles F. Botley (Hastings and St. Leonards Gas Company), Mr. Charles Carpenter, D.Sc. (South Metropolitan Gas Company), Mr. A. A. Johnston (Brentford Gas Company), and Mr. W. R. Phillips (Hitchin Gas Company)—all of whom offer themselves for re-election, with the exception of Mr. Phillips, who is retiring from the Committee in consequence of ill-health.

THE FINANCES EXAMINED.

The CHAIRMAN, in moving—"That the report and accounts and balance-sheet be received and adopted, said that, taking in the first instance the finances, it would be seen that the income was roughly £544, excluding income-tax refunded and interest on War Loan, which brought the total receipts to £723. The expenditure, excluding the interest paid to the bank on loan and overdraft and excluding the contribution of £100 to the National Gas Council, amounted to about £293. The interest on loan and overdraft was almost entirely compensated by the interest on the War Loan (£134). After meeting all outgoings, they had a balance of £191 to carry to the balance-sheet. The investment in the War Loan amounted to £4404; and the cash in hand was £235, of which £150 had lately been used to reduce the loan borrowed from the bankers for the War Loan. This was satisfactory. They had now a request from the National Gas Council for a further contribution towards their work; and upon this he should, with the consent of his colleagues, have to ask the members to express an opinion.

THE NATIONAL GAS COUNCIL AND ITS FINANCING.

In connection with the National Gas Council, certain gentlemen had been elected to represent the Association on the Executive Committee; and to the funds of the central body £100 had been subscribed by the Association. The Council had lately had much business to do in the interests of the gas industry generally, quite apart from the special work of the Association. They had had Mr. Milne Watson—representing, as he did, large interests acutely concerned in the changes that had been taking place in the costs of coal and other materials and labour—pretty well living at the public offices. He (Mr. Jones) was sorry to say that, in spite of Mr. Milne Watson's promise to him, when he accepted the presidency of the Council, that he would only be wanted about once a year, he had dragged him to these public offices so frequently that one began to wonder at the patience of himself and the public officers who received them so often. They had, on behalf of the Council, upheld the interests of the gas industry, and had applied themselves to the rectification of its needs. If anyone had a doubt—he did not think the Committee at any rate had any—as to the wisdom of associating themselves with the central body which represented every variety of interest connected with the gas industry, it had disappeared in view of the work of the Council during the past year. The work he had just sketched had involved a great deal of communication with the public offices; and he thought the members would all agree with him that, if they expected to be listened to with reasonable attention and respect at the offices of the Board of Trade, the Ministry of Munitions, or the Coal Controller, or of any of the other great Departments which were the growth of this war, and which applied themselves to the circumstances of the day, it must be done through one representative body. They could not expect the Departments to listen to more than one body, or more than one voice, in dealing with questions affecting one industry. It also facilitated matters very much when those in public Departments knew that the Chairman of the Executive Committee of the whole Council was himself at the same time the Managing-Director of the largest gas undertaking in the whole world, and resident in London. And seeing that he could be communicated with directly, being close at hand, and could open discussions or preliminary inquiries with great facility, it would be seen at once that he gave the industry a link and almost an *entrée* to the Government offices, which was a great advantage to the Association. The Association existed primarily to protect the statutory rights of gas companies, to undertake (if necessary) the cost of litigation, and to supply "points" where these statutory rights were invaded. In the list which their Secretary gave them this year as in previous years, they saw the (to borrow an expression from the British Commercial Gas Association) thousand-and-one points on which he was applied to by members for information. There were many points—such as labour, cost of materials, permits for contracts, and priority certificates for expediting orders for obtaining material—which involved a great many questions, upon which public officers naturally liked to hear an authoritative voice speaking for the whole. He was not going to labour the point as to the enormous benefit gas undertakings obtained in their entirety through association with the central body, of which he was proud to have been elected Chairman in the first year of its existence. The Council naturally had to incur a good deal of expense. When they remembered that communications were received, either generally or privately, from the central office pretty nearly twice a week, they would understand that the secretarial functions—the clerical work, correspondence, printing, travelling, and so on—of that body was very much greater than they had in an Association such as their own. The Association had an income of £544, and the ordinary expenditure came within something like £293; and it was obvious the contribution that they made to the Council was small compared with the advantage they gained from it. If they had to fight now, there would be very little difficulty in getting funds with such a central body. It became a question of the balance of advantage between the saving and the support—heartily, thoroughly, and honestly given—of the Council that were doing so much good work. He was the last man in the world to deal with capital questions recklessly, or not to see the enormous advantage of having something in the long-stocking for the day of adversity. But the long-stocking was not so necessary to the Association, because, as would be remembered, with all the fights they had had—with the alkali manufacturers over the manufacture of residuals, for bringing about the general use of the Carpenter burner, and for getting rid of the sulphur clauses—they were helped by gas companies individually without regard to any ratio or proportion. The funds were found for them; and he thought it could be said that, so long as the Association was carried on along the lines that it had been run on in the past, it would be equally helped—at any rate, it would be helped with funds quite sufficient to guarantee it against pauperism. There was little doubt they must recognize the necessity of the central body spending the money they were doing during these war times; and he should like to have some expression of opinion from the members as to the Committee increasing the expenses of the Association in this particular. He devoutly hoped they would be in favour of it, because he was confirmed in the conviction that—in spite of all the

trouble and toil that came upon Mr. Watson, himself, and others in the middle of these times of war and rumours of trouble, when the difficulties of meeting the growing wants of their consumers were greater than ever through circumstances arising out of the war—they ought not to withhold not only their personal exertions, but in an ungrudging manner their material help as well.

FINANCIAL HARDSHIPS AND A DEPUTATION.

Passing from that part of the report, he came to the question of the financial hardships that for gas undertakings had been growing month by month, and which only in the last few days had grown again in an extraordinary degree. At first they reached and badly affected only some three or four companies; but lately they had been increasing almost daily, or at any rate quarter by quarter, until even the most secure and most prosperous undertakings had had to increase the price of gas under the sliding-scale by, on the whole, something like 1s. In the neighbourhood of London, there had been evidence of this. The most prosperous and best grounded companies in the kingdom had been badly reduced; so that it became much too pressing a matter to be longer deferred. The voice of the National Gas Council showed great unanimity on the point of seeking some relief from the very serious consequences, which, if they did nothing worse, would very much have restrained the means of getting capital by the companies, both now and in the future. As he had ventured to say lately at the Board of Trade, if they once estranged capital from the industry, which had flowed into it up to the war on most reasonable terms—as little as 4½ p.ct. being taken by the investor—if they once frightened it or drove it away, the result might be extremely bad for the consumer of gas. While it would only mean a small addition to the price of gas to save the shareholders being impoverished unduly and capital estranged, if this happened it might result in companies having to do generally and more extensively what was being done at the moment—get parliamentary authority to issue capital for the time being at such high rates as 5 p.ct. debenture and 6 p.ct. preference stock. It might, indeed, have to go even higher if the ordinary dividends still went down; and this would make it a positive burden on the consumer of gas to find the interest upon a larger amount of nominal capital than was actually brought to his service. Under these circumstances, the National Gas Council had asked for, and had obtained, an audience lately with the Board of Trade, to whom the Chairman of the Executive Committee (Mr. Milne Watson) put the whole case of the companies so acutely, powerfully, logically, in detail, and so convincingly that it could not fail—and personally he was of opinion that it did not fail—to strike conviction to the Board. This interview was so very recent that what might come of it they did not know. But the authority expressed exactly the same difficulty that the Committee had expressed in the report before the meeting, that any attempt (and this was what they felt originally) to introduce a comprehensive Bill to deal with the whole question would be very difficult; and would take some time to work out. The matter was also affecting maximum dividend companies, who, as he pointed out a year ago, were in quite as bad, or in worse, condition, where the margin was not a considerable one, as sliding-scale companies, because the sliding-scale companies did not lose their money when the price of gas exceeded the standard, while it was quite conceivable that the shareholders in some maximum price companies might actually have to "shell out." In two companies of which he happened to be a Director in different parts of the world they could not, in present circumstances, pay any dividend; so that the difference of having diminished dividends and no dividends at all was very familiar to him. He had no doubt in a little time, within a few days perhaps, Mr. Watson might have some intimation as to when the Board of Trade would again see a limited number of the deputation. He thought he might tell the members this much without betraying any confidence which he ought not to betray; and probably before very long they might have some idea of the position as it stood in the minds of the public officers. The municipal undertakings had also to be considered; and, although they must seek their remedy through the Local Government Board, they were good enough and loyal enough to go with the deputation to the Board of Trade, and, through the mouth of a good speaker, who was thoroughly at home on the subject—Alderman Phillips, of Salford—to show that municipal authorities had much the same case, and desired to support the companies. This action was worth a great deal to the companies. When they could show that not merely trading companies but municipal corporation concerns were affected by the conditions, when they could get gentlemen like Alderman Kay, the Chairman of the Manchester Corporation Gas Committee, to go with them to the Board of Trade, this was worth all the contribution they were asked to give to the National Gas Council; and therefore he hoped the conviction of the members would take shape in the direction of enabling them to give a further contribution.

CALORIFIC STANDARDS AND THE RAILWAY COMPANIES.

There had been many applications by companies to the Board of Trade for the calorific standard in lieu of the illuminating power one. In connection with this, the railway companies, who appeared to have got some extraordinary information, had opposed these applications to obtain an extra pressure, which, within limits, was reasonable, because they wanted the service of gas at all hours of the night, and they mostly depended now upon the inverted burner. But they had gone farther, and impeached the good faith and practice of some companies in importing matters into their gas which were foreign to it. He personally did not know of the slightest foundation for this allegation. There was no engineer present who had had longer experience than himself; and he did not hesitate to say that it was impossible to make gas with the best results without importing into it some gases which were more or less incombustible—in fact, there was no gas made that did not contain incombustibles. The railway companies sought to prejudice gas undertakings by complaining or suggesting that these incombustibles were supplied in undue quantity, and they tried to restrict gas undertakings in this regard. Fortunately the Board of Trade would not do that, though the Orders they passed were subject to possible revision. As was known, the Board of Fuel Research were at the present time inquiring into the question of what was the kind of gas which best represented the value to be got from coal under all the circumstances—cost of material, and so forth. The Board of Fuel Research were also going to investigate other questions—such as how far gas companies, as apart from other users of coal, were in the best position to be trusted with the primary use of the coal. He thought he saw signs that, when this investigation was completed, it would be found that gas undertakings were the best means of distributing fuel, and of obtaining the several valuable components of the coal, which the populations of our cities and towns needed. They needed coke for various trade and domestic purposes, pitch for roads, benzol for motor cars, ammonia for agriculture, and they had called upon them for more gas than many undertakings knew how to deal with under the restrictions in regard to capital, materials, and labour.

MISCELLANEOUS ITEMS.

The Secretary, the report indicated, had had some twenty-five subjects upon which he had been consulted, which showed the direct use of the Association to the subscribers. It would also be seen that the total number of members was now 137; two companies having joined, and one member having withdrawn during the year. There had been a withdrawal or two through misunderstandings; but when the position was properly understood, he thought there would be a return. There were subscriptions outstanding to the amount of £75. They would be glad to have these. Funds were wanted in most institutions to-day; but money was a little tight; and small payments of this kind got overlooked.

Mr. D. Milne Watson said he had much pleasure in seconding the adoption of the report. Regarding the remarks of the Chairman as to the National Gas Council, it was, of course, impossible for the work of that body to go on without funds. He did not think anyone could say that, considering the enormous number of subjects that had been dealt with during the past year, a matter of £400 was a very large amount to have spent on the clerical work and incidental expenses. A great deal of work was generously done by members of the Council—not even travelling expenses were paid. These expenses were borne by the members themselves; and it was a heavy tax indeed upon many of them. No provision was made for this; but he hoped the time would come when they would be in such a position as to enable the Council to pay the travelling expenses of the members who came from a distance. It was quite unreasonable that anybody who travelled (say) from Scotland, the North of England, the Midlands, or any other distant part, to attend meetings should have to pay the cost out of his own pocket. At the present moment, there was no fund available for this; but it was desirable that there should be one as soon as possible. The money had been spent mainly on clerical work. The enormous amount of correspondence that had taken place, and the number of circulars that had been sent out by the Council, was probably in the knowledge of those present. He hoped the members of the Association would see their way to renew their grant; seeing that there was no other source of revenue for the Council except that derived from the four component bodies. He heartily supported the suggestion of the Chairman that a further £100 should be subscribed.

Mr. W. A. Scott asked whether the Committee had had under consideration the question as to promoting a Joint Bill for the purpose of revising the sliding-scale, or the standard price under the sliding-scale, and would the Committee welcome a resolution from the members for the purpose?

The Chairman said the matter had not gone the length of any decision as to promoting a Joint Bill. Unless they did get some relief from the appeal to the authorities, something of the sort must be put afoot—whether by some of the leading companies as a test case, or by way of a general case (which he thought the best way), he could not say. He could not anticipate the decision of the Board of Trade, nor the action of the National Gas Council. Having made an appeal to the Board of Trade, it would be a little premature to take other steps at present.

Mr. D. Milne Watson remarked that it was quite impossible for anybody to promote a General Bill dealing with this question. The rules of the House did not permit of the promotion by an outside body of a General Bill dealing with a matter affecting the legislative powers of a large number of gas companies. If legislation was the proper way, then the Government should act.

The Chairman observed that they had not been silent on the matter. A number of companies with which he was associated had had the question considered by their Parliamentary Agents; and three of the leading Parliamentary Agents at Westminster had expressed the view mentioned by Mr. Milne Watson.

Mr. Scott remarked that gas undertakings had had an additional 2s. 6d. per ton put upon the price of coal under the order of the Coal Controller; and this practically meant an extra 3d. on the price of gas. They could not increase the price of coke and other residuals to get the 2s. 6d.; and there was no further economy that could at present be applied in the conduct of gas undertakings.

The Chairman said all that was exhaustively put at the interview at the Board of Trade. If at any time it was necessary to take the views of the members of the Association on the question, there would be no difficulty in calling the members together for the purpose.

The motion was unanimously carried.

Working Relations with the National Gas Council.

Mr. George Clarry proposed the re-election of the members of the Committee mentioned in the report, excluding Mr. W. R. Phillips, who did not offer himself for re-election. In doing this, he said he should like very briefly to call to the mind of the Chairman the fact that the Association started with the National Gas Council about twelve months ago. At that time it was felt that their efforts would be increased by reason of their partnership with that body. Now it would be noticed in the report that they had been passing through what might be called a very mild season, simply because litigation and new Bills had not been prominent. The consequence was that, so far from there being a more active course, they were pursuing a more

or less passive course. Their partnership with the National Gas Council appeared to be rather of a sleeping than an active character. The Chairman and Mr. Milne Watson had shared the burden of carrying on the work of the Council; but what he felt was that the Association had not been called upon to take any share of the burden of the work of the Council. It seemed to him that the Executive of the Council were so full of energy and ability that they liked, and naturally, to keep in their own hands the various matters with which they were called upon to deal. But he thought it ought to go forth from this meeting that they, as a Gas Companies' Protection Association, were willing to bear their part of the work and difficulties during this great crisis. He did not say what they ought to do. But the record of the Association in the past was a good one; and he ventured to suggest that the matter should be taken into consideration. The members knew what the Chairman was individually doing for the cause; but presumably he was doing it as President of the National Gas Council. What he (Mr. Clarry) wanted was that the Association should be called in to do its share.

Mr. SCOTT seconded the motion.

The CHAIRMAN, referring to Mr. Clarry's remarks, said the Association, notwithstanding the existence of the National Gas Council, still retained its distinct offices. Whenever matters that concerned the industry came into the Courts or before Parliament, it was understood that the Council would refer them to the Association, just as matters that came within the province of the British Commercial Gas Association or of the Institution of Gas Engineers were referred to them. It would also be remembered that the Association sent one-third of the members to the Executive Committee of the Council.

The motion was unanimously carried.

Moved by Mr. T. H. HAZELL, and seconded by Mr. T. MAY, Mr. H. A. Stibbs, of the Portsea Island Gas Company, was elected to the vacancy caused by the retirement of Mr. W. R. Phillips.

Proposed by Mr. G. H. S. IORNS, and seconded by Mr. T. H. DUXBURY, the Hon. Auditors (Mr. W. A. Scott and Mr. Sydney Y. Shoubridge) were re-appointed.

A vote of thanks was passed to the Chairman on the motion of Mr. MAY, seconded by Mr. C. F. BOTLEY.

The CHAIRMAN, in his acknowledgment, said he accepted the vote as including also his colleagues on the Committee.

CEARA GAS COMPANY, LIMITED.

A Loss on the Year's Working.

The Annual General Meeting of the Company was held last Friday, at the London Offices, No. 9, Queen Street Place, E.C.—Mr. F. W. BROTHERS in the chair.

The SECRETARY (Mr. E. Pratt) read the notice convening the meeting; and the report and accounts were taken as read. The report stated that the result of the working for the year ended June 30 was a loss of £2875, which, taken from the sum of £3329, the balance from the previous year, left the sum of £454 to be carried forward. Coal and all other materials advanced in price during the year, as a consequence of the war; and from the same cause business in the State of Ceará was still seriously affected. The rainfall was abundant, resulting in large crops; but owing to the shortage of steamers, exports were much retarded. The public lighting accounts on June 30 were still twelve months in arrear; and the serious inconvenience thereby occasioned to the Company continued. An improvement in the rate of exchange occurred during the year.

The CHAIRMAN, in moving the adoption of the report and accounts, said he was sorry that the Chairman of the Company (Mr. F. A. Wallroth) was away ill; but they had good reports of his progress, and hoped he might soon be able to return to his duties. The Directors had again to express their regret that the results of the year's working had been so unsatisfactory; but he might say, in the words of the Chairman last year, that as long as the war continued they could not expect any material improvement. Under the present abnormal conditions, a comparison of the results was not of much service; but there were a few points to which he might draw attention. Home gas coal cost more—some 4s. per ton—with other additional expenses. The proportion of "Expediente" paid in gold in Ceará was 20 p.ct. more in the last six months. The prices of all other materials showed an upward tendency. Freights on general goods somewhat increased; a further special war surcharge having been added early in the present year, to cover the extra expenses and increased risks of voyages. On Jan. 1 the Federal Government increased the proportion of General Customs duties collected on a gold basis from 35 to 55 p.ct., which further explained the extra cost of coal and various materials, though a smaller quantity had been used. Owing to the rise in the value of the milreis, exchange was very much less—£1175. He was glad to say the management in Ceará had been able to effect some praiseworthy economies; the unaccounted-for gas, which had been a source of trouble owing to the smaller make under the half-lighting of the street-lamps, having been much reduced. On the other side of the revenue account, public lighting showed a small increase, owing to a few additional street-lamps having been put up during the year, though only one-half of them were lighted for the present. Private consumption bore evidence—as in the past two years—of economy on the part of consumers; almost every account showing a reduction in the amount of gas taken. This state of things might possibly continue until business conditions in Ceará materially improved. An improvement in business affairs there was reported—the crops (particularly of cotton) being exceptional; and if only transport were available to carry away the produce, resulting improvement should be rapid. It should be mentioned that the commercial community of the State of Ceará depended upon the dealing in, and the shipment of, the produce of the State. Turning to the balance-sheet, it would be seen that the arrears of public lighting stood at practically the same amount as on June 30, 1916. Seven months—viz., from June to December, 1915—being in expired years, would be met by a special credit, which it was hoped the State would be able to raise in the near future. All accounts in 1916 were paid by June 30; and meanwhile the State Treasury endeavoured to keep up the payment of one account monthly. In April last these continued arrears, combined with the huge increase in the cost of coal and other materials and their transport to Ceará, had severely depleted the Company's resources; and the raising of further capital became inevitable. The Chairman therefore convened a meeting of the principal share and debenture holders, and laid the state of affairs before them. Some useful suggestions were made; and, in the result, it was decided to invite the various holders of the Company's stocks to subscribe to an issue of debentures (subject to the necessary consent of the Treasury), bearing interest at 8 p.ct., in proportion to their respective interests in the Company. The Directors, of course, subscribed to this new issue; and in May and June, having to meet the payments for coal and freight on a cash basis, they found themselves obliged to anticipate their own subscriptions. Their amounts (together with those received from other share and debenture holders) augmented the item of sundry creditors by the sum of £3085 at June 30. The sum raised by these debentures amounted to £7500; and in view of the present stringency of monetary conditions, the Directors regarded the response as not unsatisfactory. They hoped that this sum would be sufficient to see the Company through their troubles, until the return to more normal and more prosperous times. To summarize, the Company's difficulties had arisen almost entirely through the adverse conditions brought about by the prolonged war. The Board could only express the hope that, when they met the shareholders again next year, this scourge might have passed away, and that a new and material improvement in the Company's position and prospects might have commenced.

Mr. T. M'MAKING seconded the resolution, which, after the Chairman had replied to one or two questions, was unanimously adopted.

The retiring Directors (Mr. F. E. Linging and Mr. Charles Webb) were re-appointed, on the proposition of the CHAIRMAN, seconded by Mr. M'MAKING; and the Auditor (Mr. W. J. Wright) was re-elected, on the motion of Mr. T. P. FISHER, seconded by Mr. R. M. LONG.

The CHAIRMAN proposed a hearty vote of thanks to the Engineer and Manager and the staff in Ceará and London. He remarked that the troubles of the Company were attributable to causes over which their excellent staff had no control.

Mr. M'MAKING, in seconding, said this was the first year's administration of their new Engineer (Mr. W. A. V. Watson) and it had been a very difficult time indeed for him. The Company were to be congratulated upon having such a capable man out there. Considering the circumstances, he had done very well.

The vote was duly accorded; and the Directors were also thanked for their services, upon the proposition of Mr. LONG, seconded by Mr. F. W. CHURCH.

ANNUAL REPORT OF BRITISH DYES LTD.

The following is the text of the annual report of the Directors of British Dyes Ltd., which was issued to the shareholders last week:

CAPITAL.

The issued share and loan capital of the Company as at April 30, 1917, consisted of: Share capital subscribed (942,069 shares of £1 each, 15s. per share called up) £942,069; loan from Government, £1,142,069; making a total of £2,084,138.

RESULTS OF THE YEAR.

The Directors are glad to be able to report that, subject to the adjustment of the allowances under the Finance and Munitions of War Acts, they regard the results of the year's trading as very satisfactory; and they feel justified in recommending the payment of a dividend at the rate of 6 p.ct. per annum, which is the maximum amount allowed. The shareholders will accordingly be asked to approve the payment of a dividend at that rate.

SUPPLY OF DYES AND INTERMEDIATE PRODUCTS.

The production of dyes continues to be limited by the shortage, caused by the war, of certain materials. But notwithstanding this, the supply throughout the year has been increased, and the variety of dyes extended. An extensive plant for the production of azo colours has been completed, and is now in operation. The range of direct cotton colours has been supplemented by the inclusion of a yellow, violet, and green. The supply of wool colours of this type has been enlarged. The production of methylene blue has been largely increased; and the output of mordant colours of the type of khaki yellow, green, and brown is now sufficient to meet the demands made upon the Company for dyestuffs used in the manufacture of the varied clothing equipment of our own and Allied troops. Among the vat dyes of the indanthrene type, a blue and yellow are being produced. It is hoped shortly to extend the range of these colours. The Company have produced a colour similar to the alizarine blue dyestuff for wool of exceptional fastness to the action of light. The requirements of the Government for dyes for a variety of military purposes have been fully met, and this demand has to some extent necessarily interfered with the regularity of supplies to the trade. Important installations for the manufacture of intermediate products, including paranitraniline and beta naphthol, have been completed. Plants for the manufacture of other products are being proceeded with as rapidly as possible; and as these come into operation, they will provide materials from which the variety as well as the quantity of colours manufactured can be augmented.

NEW WORKS.

In addition to the plant referred to, the following important work, as well as much minor work, has been carried out: (1) The construction of the works' railway and its branches has been well advanced towards completion. (2) A number of large new sheds for the manufacture of intermediate products and colours have been completed. (3) The electrical installation has been completed; and both

the old and the new works are now entirely operated by the Company's own plant. (4) A power-gas plant has been completed, and is in operation. (5) A water-service reservoir, with a capacity of 2,000,000 gallons, has been constructed. (6) A pipe system for the distribution of gas, steam, and compressed air throughout the works is approaching completion.

Research Department.

The work of the research department has received a great deal of attention during the year, and increased facilities for laboratory and experimental work have been provided. As soon as arrangements can be made for the supply of labour and materials, the construction of the main research laboratory at Huddersfield will be commenced; the plans having already been prepared. In the meantime, research work on behalf of the Company is being carried on at the Universities of Oxford, Leeds, and Liverpool, in addition to the work done in the several laboratories attached to the works.

Staff.

Mr. S. E. Bastow has been appointed Chief Engineer to the Company, and has been added to the Technical Committee. The staff of qualified chemists is being steadily increased, and now numbers well over a hundred. Arrangements have been made to encourage the study of chemistry at the Universities and technical schools; and the Directors propose, in order to meet the future requirements of the Company, to take special steps to secure a sufficient number of students, and to equip them with a thorough scientific education and training. They rely on the approval by the shareholders of any expenditure which may be necessary for this purpose.

Co-operation.

The question of co-operation among dye manufacturers has been engaging the attention of the Board of Trade throughout the year; but they have not yet taken any definite steps in this direction. The Directors have throughout maintained the attitude that they will welcome any tangible proposal for co-operation with other manufacturers, provided that the interests of the textile and other industries dependent on the supply of dyes are safeguarded and that the co-operation can be carried into effect in a manner consistent with the object for which this Company was established.

The Future of the Dye Industry.

The Directors would again emphasize the fact, that before dye-making can be established as a national industry in this country, it is necessary to put down plant to manufacture intermediate products; and the provision of plant for this purpose has largely devolved on the Company. While a great deal has been accomplished, with limited means and under difficult conditions, in producing dyes to satisfy immediate needs and in laying the foundations of the industry, it should be clearly recognized that not much more than a beginning has been effected up to the present, and great efforts have yet to be made. The supply of materials, plant, labour, qualified chemists, and of capital, must be very largely increased. The need for the employment of greatly increased capital is emphasized by the fact that the recently published accounts of five of the German dye manufacturing firms show assets which amount in the aggregate to upwards of £35,000,000 sterling, including cash resources of approximately £10,000,000 sterling.

FIFE COAL FOR GAS MAKING.

Objections to the Controller's Transport Re-Organization Scheme.

A largely attended meeting of representatives of gas companies and corporations in Area No. 19 [whose supplies for gas-works purposes have been restricted by the Coal Controller and the District Coal and Coke Supplies Committee for Scotland to Fifeshire coal only] was held in Dundee last Friday week—presided over by Lord Provost Don—at which a Committee was appointed to draw up a memorial for presentation to the Coal Controller, to be followed by a personal interview.

At the beginning of this month a circular-letter was sent out to gas-works in Area No. 19, signed by Mr. R. S. Johnston, the Secretary and Treasurer of the Commercial Section (North-Eastern District) of the North British Association of Gas Managers, in which it was pointed out that at a meeting of the section held in Perth "a strong protest was made against the action of the Coal Controller and the District Coal and Coke Supplies Committee for Scotland in restricting the supply of coal for gas-works in Area 19 to Fifeshire coal only, having regard to the fact that many of the coals from this district are entirely unsuitable for gas-making purposes. The consensus of opinion was that a proportion of coal from Fife could be used with an equal quantity of Lanarkshire or Lothian coal. The restricting of supplies to Fifeshire coals only would entirely defeat the purposes the Coal Controller has in view—viz., the reducing of haulage, &c. Experience has shown that the reverse would be the case, as, owing to lower volume of gas and poorer quality of residuals, a greater quantity of coal would be required, which would necessitate extra expense both for coal and labour in handling. While the gas industry has done, and is doing, invaluable work for the nation, and has evinced a loyalty and patriotism second to none, it is felt that they must protest against the position they have been placed in. The meeting therefore agreed that Mr. Alex. Yuill (Dundee) and Mr. Samuel Milne (Aberdeen) should convene a meeting of representatives from corporations and gas companies in the district at an early date, to take the necessary steps to bring the matter before the Coal Controller." Before the meeting was arranged, the gas managers were asked to fill up a form, giving particulars of coal used during the past year, with the quantity drawn from the different areas. Further, an opinion was desired as to the quality of any coal used from Fifeshire, since the re-organization scheme came into force, both from a gas-making and residuals point of view.

Mr. Alex. Yuill explained the cause of the trouble and the steps that had been taken, so far without effect, to remedy it. The north-eastern district, he claimed, had been placed in a most disadvantageous position as compared with other gas-works. Fife coal was unsuitable for gas-making purposes; and the consensus of opinion was that if the Coal Controller gave them coal of a nature that would blend with the Fife coal it would help them to a considerable extent. Fife coal for gas-making could not compare with the coal from the Lanarkshire and Lothian coalfields; and in support of this statement, he read a number of communications from gas managers in the district, showing that they had experienced the same difficulties. Communication had been made to headquarters; but they never got beyond the usual stereotyped reply that the matter was to be considered. From an economic point of view, the restriction had brought about no economy; the saving in transit being more than counterbalanced by the loss involved in the production of gas and other difficulties which the smaller gas-works, in particular, owing to shortage of plant, were not so well able to surmount.

Mr. Sutherland (Peterhead) said he was sure they had no desire to be unpatriotic or increase the difficulties of the Government; but they could not take the responsibility of lessening the consumption of gas. He therefore strongly appealed to all present to make their complaint known to the Coal Controller.

Mr. David Vass (Perth) said they were up against a mechanical difficulty which must be solved for them. They might go on for a few weeks with the material that had been allocated; but if they were compelled to continue with unscreened or semi-screened coal, they would have a serious breakdown.

Mr. A. Russell (Glasgow) said he had had a conversation with a Fife coalmaster; and he understood that next week permits might be granted for cannel coal.

Mr. J. Nicol (Carnoustie) said that if the quality of gas was reduced for cooking and business purposes, there would be a big loss to the country; and any expense saved in transit would be wiped-out by the losses that would accrue in other channels.

Mr. Samuel Milne claimed that gas-works were entitled to special consideration at the hand of the Controller. Coal in gas-works was used in a different manner from that consumed for steam or household purposes. In gas-works, coal was carbonized, and the coke was sold, thus saving a corresponding amount of coal in these areas as well as haulage. Other reasons why they should have special consideration were the importance that the Ministry of Munitions and the Board of Agriculture attached to gas-works at the present time, and the fact that such works did not conflict with other industries. It had been found that Fife coal produced 10 p.ct. less gas, which meant 10 p.ct. more tonnage, 10 p.ct. more labour at the collieries, 10 p.ct. more for carbonizing charges, and 10 p.ct. less available stand-by plant. The situation was aggravated by the fact that another 10 p.ct. extra had been granted by the Coal Controller for coal charges; and due to this unreasonable and, he thought, unwarranted increase, the price of coal was up 2s. 6d. per ton. It was stated that this increase was to meet the increase in miners' wages; but 1s. 8d. would have been quite sufficient. Why had the other 10d. been added? In addition, some of the agents would be charging 2s. 6d., *plus* 9d., which was authorized by the Controller, who, in his opinion, was simply setting up monopolists. Had there been the usual competition among merchants, they would have been scrambling for the business at 2d. and 3d. per ton, instead of 9d. In regard to the allocation, far too much had been left to the collieries' option. Having regard to the present position of national affairs, he was of opinion that were they to be allowed 50 p.ct. of their requirements from Lanarkshire or the Lothians, there would be no undue hardship inflicted if they accepted 50 p.ct. from the Fife coalfields. This was what they should appeal for; and so far as Aberdeen was concerned, they heartily approved of sending a memorial to the Coal Controller direct, as they had exhausted their powers of persuasion with the Coal and Coke Supplies Committee in Glasgow, which might be more correctly designated the Coalmasters' Association Committee. They had a good case. Let them do all they could to attain their end. As gas managers and gas administrators, they were willing and anxious to accommodate themselves to the national needs; but at the same time they could not quietly submit to a policy which they regarded as economically unsound—a policy that was to place the consumers in a position of hardship, financially and otherwise, and which in their opinion was uncalled for and unwarranted to the extent proposed by the Coal Controller's Department.

Lord Provost Scott (Perth) formally moved that a protest be made to the Coal Controller, that he be asked to withdraw the restriction to the extent that 50 p.ct. of the coal required for gas-making purposes be supplied from other than the Fife collieries; and that, if need be, this appeal be backed up by a deputation consisting of representatives from Dundee, Aberdeen, Perth, Peterhead, Stirling, and Arbroath.

Mr. W. Ritchie (Peterhead) seconded, and stated that a similar memorial had been lodged by gas managers in the North of Scotland.

The motion was unanimously agreed to; and, on the suggestion of Mr. M'Intosh (Fraserburgh), it was further decided that parliamentary action should be taken in the event of the wishes of the deputation not being met.

Mr. W. Wilson (Falkirk), representing the North British Association of Gas Managers, intimated that this body were prepared to support the North-Eastern District in any action they took.

Cases at the Yorkshire Military Tribunal.—At the West Riding Appeals Tribunal, at Leeds, last week, the Garforth Gas Company appealed for their Manager and Secretary, who is classified B (1). In answer to questions, the Manager said it was not true that he merely ran the office. He was a technical engineer, though not a practical one. His salary was £130 a year, and house, coal, and gas were provided. The military representative contended that a man over military age should be got for the position. The decision was that the Manager must join the Colours at the end of the year. At the same tribunal, conditional exemption to the end of January was given to a fitter at the same gas-works, aged 37, and married.

GAS FOR MOTOR VEHICLES.

Notes from Various Sources.

The Automobile Association has been in communication with the Ministry of Munitions concerning the use of coal gas on motor vehicles. The Association asked for an official assurance by the Department to the effect that coal gas may be used on motor-cars without restriction. The Minister of Munitions has replied that, so long as the gas is conveyed, as is the case at present, in bags, at or slightly above atmospheric pressure, and not compressed in steel cylinders, it is not considered that there is at the present time any need on general grounds for restricting the use of coal gas for motor purposes. At the same time it is pointed out that if motorists were to use coal gas on any considerable scale, it might, in the interests of national requirements, become necessary at some future time to impose certain restrictions upon its use.

The Secretary of the British Commercial Gas Association (Mr. W. M. Mason) rightly considers that we shall be interested in knowing that, at the special request of the Commercial Motor Users' Association, they have just issued to all the gas undertakings in the United Kingdom the following questionaire, so that information may be collected in connection with a subject that is rapidly assuming National importance:

(1) Name of gas undertaking. (2) Names and addresses of points at which gas may be obtained for filling motor gas containers? (3) Price of gas per 100 c.ft.? (4) Extra charges, if any? (5) Hours between which supplies may be obtained? (6) Facilities for speedy supply? (7) Any other conditions or information.

Since the foregoing list of queries was issued, an important letter has been received by the "B.C.G.A." from Mr. E. S. Shrapnel-Smith, the Economy Officer to the Petroleum Executive, which has necessitated the issue of a supplementary inquiry to all the more important undertakings throughout the country. Mr. Shrapnel-Smith's letter is as follows:

Sir,—I am instructed to invite the co-operation of your Association in the matter of immediate help to relieve the serious petrol situation. It is of the utmost national importance to maintain the transport services of the country, both as regards the satisfactory conveyance of the public by motor-buses and like vehicles, and the transportation of foodstuffs.

Mr. Long has heard with regret that, in some parts of the country, it is even yet not fully apprehended by managers of gas undertakings that the provision of the necessary facilities for supplies of gas for road traction is a matter of the greatest national urgency.

Perhaps you will be able to let me know how far particular works are able to move in this matter of supplies, or are on the point of moving in the matter of providing filling and refilling facilities.

The Government, through this Executive, the Petrol Control Department, the Ministry of Food, and other branches, is directing the widespread attention of owners of commercial motors of all types to the use of gas as an alternative fuel.

If you can request local undertakings to get in touch with local motor-bus and motor-van owners and to co-operate with them, you will be helping to reduce the bad effects of the present deficiency of transport at large, and so further to aid the State.

It will particularly assist this Executive if your Association will at the earliest convenient date furnish me with lists of: (*a*) Undertakings which cannot supply gas for road-traction purposes, and the reasons; (*b*) undertakings in the supply areas of which added demands for gas are sought.

(Signed) E. S. Shrapnel-Smith, Economy Officer.

Supplementing the foregoing letter, Mr. Mason says that what the Petroleum Executive desires to ascertain from each gas undertaking is: (*a*) Whether there are any special reasons which make it difficult or impossible for supplies of gas for motor-cars to be provided (such special reasons including existing excessive demand for gas, grave shortage of labour, delayed repairs or extensions of works, and shortage of coal or oil). If the answer is in the affirmative, please give particulars of reasons. (*b*) Whether additional sale for motor vehicle purposes would be welcome. The policy of the Petroleum Executive will be, as far as is practicable, guided by local conditions as revealed by the replies to this inquiry.

Readers may be reminded that it has been arranged to have a discussion of points specially appealing to the gas industry on the subject of gas for motor vehicles, at the annual general meeting of the "B.C.G.A." to be held to-morrow in the Royal Society of Arts Hall, John Street, Adelphi. The discussion will commence after the transaction of the formal business—probably about 3 p.m.; and the Committee will be glad to welcome representatives from undertakings, not at present members of the Association, who may be interested.

The "Manchester Guardian" says: "In Manchester alone some 200 cars—private and business—are now being driven by coal gas; and though the new power is not yet being used to any extent for taxi-cabs, this development is certain to occur when the Town Hall is ready with the new rules and regulations."

In advertisements in the same Manchester paper, it is seen that the Blackpool Gas Department are prepared to fill flexible containers at 3d. per 100 c.ft., with an extra charge of 6d. per fill at week-ends. The Blackburn Corporation Gas Department advertise that particulars as to filling can be obtained from Mr. John W. M'Lusky, the Engineer and General Manager. The Manchester Corporation make an an-

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nouncement of the addresses of their filling stations, with gas priced at 4d. per 100 c.ft. (cash on delivery). The Preston Gas Company advertise that they have arranged a high-pressure supply of gas for motors at their works, at a charge of 2s. 6d. per fill. The Macclesfield Gas-Works are supplying gas at 4d. per 100 c.ft. for motor purposes. The Oldham Corporation Gas Department are advertising gas for motors at the rate of 25 c.ft. for 1d.

At Newcastle-on-Tyne, it has been suggested, in order to facilitate journeys, that drivers of commercial vehicles need not take cash with them to pay for gas refills, but might be provided with books of tickets, which would be acceptable for payment for gas at any garage or gas company's works on the North-East Coast.

GAS-METER TESTS AT MANCHESTER.

Dispute between the Justices and the Corporation.

According to the "Manchester Guardian," the long-standing question of the testing of gas-meters was to be brought up again at the quarterly meeting of the Manchester City Justices yesterday (Monday). A resolution was to be proposed "that the Gas-Meter Testing Committee of the Justices be instructed in future to test and stamp all meters according to the Sale of Gas Act, 1859, and that the double test be abolished." The old controversy between the Justices and the Corporation Gas Committee is thus reopened.

By the Act of 1859 the Justices were constituted the authority in charge of the testing of meters in a town where the corporation was the manufacturer of gas. They were really placed in the position of guardians of the public interest as against the vendors, the corporation. Fifteen years ago the Justices and the Manchester Corporation entered into an agreement recognizing a stringent system of testing. Under this many thousands of meters have been examined, and a high proportion of cases of error detected. In February, 1916, the Gas Committee decided on a modification of their requirements. They passed a resolution that after the following month the testing of the indexes of meters should be discontinued, and that in future the Committee would simply "comply with the regulations of the Sale of Gas Act in regard to the testing and stamping of meters." By the double test, which they withdrew as non-essential, is meant that the index and drum of a meter should be tested separately, and certified as correct before it is stamped and issued as a completed instrument. The reasons given were that after many years' experience the index test was found to be "apparently useless;" that it was not required by any Act of Parliament; and that its cost was a waste of public money.

The Justices' Committee have so far refused to alter their system, and have insisted on the index-test as a safeguard against overcharge. They admit the stringency of their regulations, but claim that, while not actually specified in the Act, the index-test is implied in the general instructions laid down. The dispute appears largely to turn on the rather technical question of the utility of the double test; and as each party holds to its own contention, an unfortunate deadlock continues. Already it has had the effect of very considerably reducing the number of meters tested at the Manchester station; for the decision of the Corporation allows meters to be installed in the Manchester area which have been tested at other stations, like Salford and Oldham, where the requirements are said to be less onerous.

A few weeks ago the Corporation Gas Department, in inviting tenders for the supply of meters, stated, among other things, that they "must satisfactorily pass the tests as specified in the Sale of Gas Act, and bear the stamp of a recognized Government testing office, in accordance with the Act."

NEW YORK AND THE CALORIFIC STANDARD.

Inquiry by the Public Service Commission.

Towards the end of September, the first hearing took place before the Public Service Commission (First District) of New York, with regard to the proposed change from an illuminating power standard of 22 candles for the gas supplied to a calorific power standard; and copies of our contemporaries the "American Gas Engineering Journal" and the "Gas Age" contain brief accounts of the proceedings at the earlier sittings. While the gas companies favour the change in the standard of measurement—urging that it would be beneficial to the consumers—they contend that there can be no resultant reduction in the price of gas, as has been suggested by the Public Service Commission. Mr. Oscar S. Straus presided.

An opinion favourable to the calorific standard, as being the best known method of measuring gas, was given by Mr. W. F. Hine, who, as Chief Engineer of the Public Service Commission, was the first to give evidence. Mr. R. S. M'Bride, a Chemist of the Bureau of Standards, Washington, expressed his belief in general that heating value is preferable to candle power value in gas. But his view is that, unless it is possible to reduce the price in proportion to the service now rendered, he can see no reason why a change should be made.

It is the intention of the gas companies to introduce figures showing that, at the present rate of 80 c. per 1000 c.ft., there is a heavy financial loss, due to the high cost of labour and materials used in the manufacture and distribution of gas, including the service rendered. In the case of the Consolidated Gas Company, the contention is made that, to collect the actual cost for gas during the ensuing year, assuming the prices of labour and materials to remain unchanged, and

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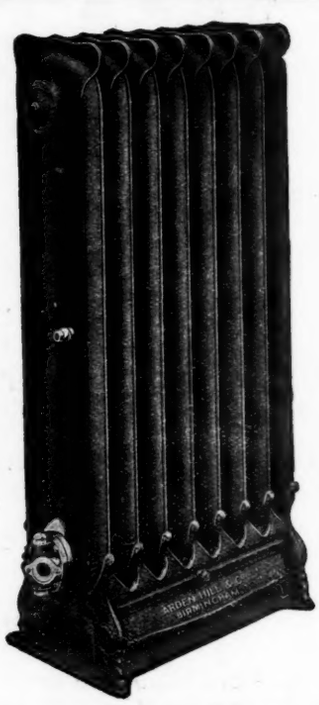

DOUBLE-COLUMN RADIATOR.

that gas having a calorific power of 585 B.Th.U. were delivered, instead of 22-candle power, it would be necessary for the Company to charge 91·4 c. per 1000 c.ft. of gas sold to the public. The Company state that they are now paying 5 c. per gallon for gas oil, and the contract expires at the end of the current year. Other companies have recently made contracts for gas oil at prices ranging from 6½ c. to about 7 c. per gallon. An increase of 1 c. in the price of gas oil, it is contended, would operate towards still further reductions in the Company's earnings, and increase the present deficiency approximately $600,000. If the Company have to pay 7 c. for oil, their earnings will be further impaired to the extent of approximately $1,200,000. More than 400,000 gas consumers in the boroughs of Manhattan and the Bronx, it has been shown, use less than 5 c. worth of gas a day; so that an increase of 15 p.ct. would add, on the average, substantially less than seven-tenths of a cent, and probably not more than one-half of a cent a day to the cost of their gas.

Discussing the matter, Mr. Robert A. Carter, the Vice-President and Secretary of the Consolidated Gas Company, stated that every gas company in the State of New York, with the exception of those doing business in New York City, is supplying gas under the calorific standard, as ordered by the Public Service Commission for the Second District. If, during the ensuing year, the Consolidated Gas Company were to produce and deliver to their customers gas having a calorific value of 585 B.Th.U., the deficiency in the amount collected from customers below the actual cost of gas would amount to $1,892,335. It is estimated that the actual cost of gas for the ensuing year, including 6 p.ct. interest upon the investment, as measured by the present value of the property devoted to the public service, assuming the prices of labour and materials entering into the manufacture and distribution of gas to remain unchanged, and that gas of 22-candle power is delivered, will be $1·05 per 1000 c.ft. sold to the public. If gas having a calorific value of 585 B.Th.U. is delivered, the actual cost on this basis will be $1·01 per 1000 c.ft. of gas sold.

Mr. Straus offered the Company the following suggestions regarding the change of standards: That the option be permitted to the Company to furnish, at the present price, either gas of the 22-candle power standard or gas upon an alternative B.Th.U. standard—this latter standard to be equal to the average of B.Th.U. now furnished by the Company, or based on some other figure to be determined by the Commission. That any company, after exercising such option to furnish gas on a B.Th.U. standard, may also exercise an option for specified periods to furnish gas with less B.Th.U., with a reduction in price to consumers in accordance with a table fixed by the Commission.

A Fourth War-Time Increase.—The Leeds Gas Committee have decided to increase the price of gas by 3½d. and 4d. per 1000 c.ft., according to the quantity used. This is the fourth war-time increase. The present charges are 2s. 9½d. for lighting purposes and 1s. 11d. per 1000 c.ft. for power.

THE TAR DISTILLING INDUSTRY.

By "Observer."

The war is teaching the country many lessons in the realm of industrial and scientific co-ordination, and has shown that there were many weak spots in pre-war methods. Though there has been great expansion in the tar-distilling industry, there has been but little actual development on these lines; and after the war conditions will be very much the same as previously. The greatest need of the war has been for production at any cost; and in this sense, both the producer and the distiller have worked to the uttermost to further this object.

The tar industry is a key one of the first importance, which should be developed by the best scientific and commercial brains available. In the past, millions of pounds' worth of tar derivatives which should have been of home manufacture have been imported into this country, though the manufacture of some of these products has already been commenced. The question arises, Can it be continued when normal prices rule, and we are faced with the highly organized combination of interests that our competitors possess? Government protection is one way of meeting the danger; but this would not be fully effective unless the industries in question are fully organized.

If a key-map were made of the whole country—showing where the tar was produced, where it was treated, and the ultimate destination of the final products—it would be found to present a record of absolute waste and chaos; the tar being in many cases transported away from where the finished products are sent, and in others not being distilled at works adjacent to the source of production. All this must represent many thousands of pounds loss, both to the producer and to the distiller. The tar-distilling industry is, in the main, composed of a number of works, which, with the best intentions, have many of them neither the capital nor the scientific knowledge to treat the product to its best advantage. If this is not done, then the producer must ultimately suffer; for the better use the distiller makes of his product, the more valuable it becomes. The producer may have this conclusion obscured by a number of secondary issues; but the fundamental truth remains—that the works that merely distil the tar cannot afford to pay the same price as the works which, by employing large capital, are able to use all the aids which Science can offer. The individual seller of tar may not perhaps see this as a direct result; for the market value of tar is doubtless an average of all the conditions. If this average efficiency and profits are raised, the price of the crude product must also rise.

At works where, by reason of freight charges, the producer is tied to one distiller, dissatisfaction with the price received is often felt; for whatever that price may be, the producer will believe he ought to get more. One cannot but think how much better it would be if such producers (and they constitute a large body) could feel that the price they received was not determined by their local distiller, in whose reverses they must perforce be unwilling partners, and who may or may not give them a proper price; but that it was determined by the

WAR ECONOMY.

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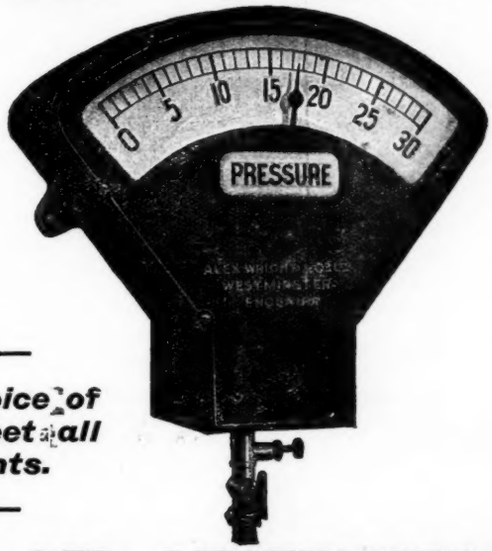

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actual results and profits obtained over the whole industry, which would be at one level of efficiency, and that the highest possible.

The tar distiller, in reply to the gibe that he does not conduct his business on the best possible scientific lines, would probably retort that he cannot afford costly chemical research, neither can he erect new and possibly experimental plant, so long as he has no security of tenure—that is to say, his supply of raw material from the producer may be, and is often, cut off, by reason of factors beyond his control. The producer already possesses this security of tenure. In the case of gas-works, it is the right to supply gas; and with coke-ovens, costly plant is only erected when the supply of coal can be assured during the life of the plant. Security of tenure is, therefore, the basis on which the producer can erect the most economical and scientific plant. This factor is also essential to the tar distiller before he, in his turn, can make the fullest and best use of his raw material, and of his experience and knowledge of the business. Insecurity of tenure makes the tar-distilling industry a highly speculative one, and hence tends to reduce the price of the raw material. For the producers to distil their own tar is only a partial solution of the difficulties inherent to the industry as now conducted; for such distillation and treatment is, as a rule, only a partial one, and, on the whole, the producer distilling his own tar would have realized over a series of years a better price if he had sold to a distiller who carries the treatment to a more advanced stage, and by reason of his expert knowledge can also usually sell to better advantage.

With a product in which freightage plays such an important part, there should be no such thing as unrestricted competition or a "free market." This may seem heresy; but the only true market is the nearest tar distiller, who is, or should be, in a position to bring to his aid every chemical, engineering, and commercial factor. The result will ultimately re-act to the benefit of the producer. The greatest and most important need is such co-ordination of the producer and the distiller as will ensure for the latter security of tenure. This would mean the best use being made of existing plant, the expenditure of capital on new and improved processes, and the employment of the best brains for chemical research, the results of which would be available to the whole industry. In fact, the vista of possibilities and development is limitless.

The tar producing and manufacturing industries have hitherto been too frequently antagonistic; but this ought not to be, for the adversity of one re-acts on the other. Surely it is not beyond a man of vision who possesses the necessary organizing powers to bring the conflicting elements into line, and weld them together, so that the producer and the distiller are equally assured of their proper share of the enhanced profits and benefits which could be obtained under new and better conditions.

The Directors of Meters, Ltd., have declared interim dividends on account of the current year at the rate of 5½ p.ct. per annum on the preference shares and 4 p.ct. per annum on the ordinary shares.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *Oct.* 29.

The position of those tar products which are controlled by the Government is unaltered; creosote being worth 4½d. net per gallon in bulk at makers' works subject to official permit to purchase same. Pitch is in steady request for both home and export trade. Solvent naphtha is scarce, and the demand unusually good. It is stated that about 4s. net per gallon is obtainable for delivery now to June next.

With regard to sulphate of ammonia, it is understood that the issue of export licences has been suspended again, in order to provide supplies for munition purposes and for home agriculture. The official prices for farmers remain in force until the end of May next.

Tar Products in the Provinces.

Oct. 29.

Markets for tar products are fairly steady. Solvent and heavy naphthas are firm.

The average values for gas-works products during the week were: Gas-works coal tar, 26s. 3d. to 30s. 3d. Pitch, East Coast, 20s. to 25s. per ton; West Coast—Manchester 17s. 6d. to 18s. 6d., Liverpool 17s. 6d. to 18s. 6d., Clyde 18s. to 19s. nominal. Benzol, 90 p.ct., North 10½d. to 11½d.; 50-90 p.ct., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha, in bulk, North, 7¾d. to 8¼d. Solvent naphtha, naked, North, 3s. to 3s. 1d. Heavy naphtha, North, 1s. 6d. to 1s. 8d. Creosote, in bulk, North, 3¾d. to 4d. Heavy oils, in bulk, North, 4¼d. to 4½d. Carbolic acid, 60 p.ct., East and West Coasts, 3s. 4d. naked. Naphthalene salts, 80s., bags included. Anthracene, "A" quality, 3d. per unit; "B" quality, 1½d. to 2d.

FROM A MARKET CORRESPONDENT.

Tar Products.

London pitch remains at about 48s. per ton f.o.b., and Provincial centres report increasing confidence in the future of the trade. The export demand remains decidedly good; and if only better shipping facilities could be obtained, a very much larger business could be done in the Provinces. Further small shipments have been made to France from North-East ports during the past week at about 28s. per ton f.o.b. While this is a higher price than can be obtained for pitch for home consumption, it encourages makers to hold out for better prices for the latter. The result is that it is difficult to buy pitch anywhere in the Provinces under 21s. to 22s. 6d. per ton. Solvent naphtha is still a very firm market, although there has been some slackening in demand, which is not at all surprising after the rapid advance of the last two weeks. Supplies are still scarce, however, and the tendency

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of the market is towards higher quotations. The demand for naphthalenes is well maintained at late rates. Cresylic acid is quietly firm; but creosote is influenced by rumours of complete official control. No prices have yet been fixed; but the trade does not anticipate any reduction in the recent quotation of 4½d. per gallon. Benzol and toluol are nominal. In America, prices for limited quantities of toluol are about 7s. per gallon; but producers are delivering about 90 p.ct. of their output to the Government and the Allies at 6s. per gallon. Yet, in spite of the present production being the largest in the history of the country, it does not meet official requirements, and steps are being taken to increase the output. It would seem that any increase must come from the gas companies, since all the steel plants able to do so have already installed bye-product ovens—there being over 10,600 in operation at the present day. The increased output of toluol has brought about a larger output of benzol, which is in excess of immediate requirements. Benzol is now about 2s. 1d. per gallon. Reduced quantities have been exported to France; and in some instances the benzol is being converted into picric acid for France instead of for the American Government—thus lessening the total amount of benzol going into consumption. No change is to be noted in other tar products at home; the range of quotations being as follows:

Aniline Oil (pure): 1s. 3d. per lb.

Benzol: 90% London, 1s. 0½d., North 10½d. to 11½d.; 50% North 1s. 4d. to 1s. 5d. naked per gallon.

Carbolic Acid: 60% East and West Coast 3s. 6d. per gallon; crystals 40%, 1s. 3d. per lb.

Crude Tar: London 30s., Midlands 24s. 6d. to 25s. 6d.; North 25s. 6d. per ton, *ex* works.

Pitch: London 48s. f.o.b.; East Coast, 21s. to 22s. f.o.b.; West Coast—Liverpool and Manchester 21s. to 22s. f.a.s., Clyde 22s. per ton.

Solvent Naphtha: Naked London 90-190% 1s. 10d. to 2s.; North 1s. 6d. to 1s. 9d. per gallon; 90-160% naked London 3s. 6d. to 3s. 9d.; North 3s. 3d. to 3s. 6d. per gallon.

Crude Naphtha: Naked 30% 8¼d. to 8½d.; North 6¼d. to 6½d.

Naphthalene: Refined £32 10s. to £35; salts 80s., bags included.

Toluol: Naked, London 2s. 4d.; North 2s. 3d.

Creosote: Nominal, London 4¼d.; North 3¾d.; heavy oil, 4½d. per gallon in bulk.

Anthracene: "A" quality, 40-45%, 4½d. per unit; "B" quality, 1¾d. to 2¼d.

Cresylic Acid: 95%, 2s. 6d.; 97-99%, 2s. 6d. to 2s. 7d.; Glasgow 2s. 3d. *ex* works London and f.o.b. other ports.

Grease Oils 18° Tw. (naked), £6 per ton f.o.r. makers' works.

Sulphate of Ammonia.

There is very little change in the position of sulphate, and a good trade is maintained for early and future deliveries at the fixed rates. It has been officially stated that provision has been made to meet the increased demands from farmers, and steps are being taken to extend the output. The supply of sulphate for agricultural purposes is likely to amount to 190,000 tons during the present season—an increase of 40,000 tons over last year. In view of the heavy home demands, the quantity which will be available for export can only be small; and as it is to this part of the trade (when it is obtainable) that makers at present look to make a profit on, there is considerable dissatisfaction with the current export quotations of £23 to £25 per ton, and basing their calculations on the present export value of nitrate of soda, and a comparison of the nitrogen value of that fertilizer with that of sulphate of ammonia, makers claim that the f.o.b. value of the latter product should be several pounds higher. Certainly the difference is difficult to explain. At the same time, it must be recorded that one prominent firm gives a nominal price of not less than £27 to £28 per ton net cash, double bags, f.o.b. any port.

Quotations (basis 24½ p.ct. single bags): October-December £15 15s. per ton, January-May, 1918, £16 7s. 6d. delivered; 10s. per ton less at makers' works. Export, £24 to £25 per ton f.o.b. London, Leith, Glasgow, Hull, or Liverpool.

A Coal-Crusher Fatality.—At the Kingston Gas-Works, an employee fell into the coal-crusher; and had to remain entangled there for six hours, while portions of the machinery were removed. He died on the way to the hospital.

Belfast Gas Output Increased.—Mr. J. D. Smith, the Engineer and Manager of the Belfast Corporation Gas-Works, reported to the Gas Committee last week an increase of 14·31 p.ct. in the gas sent out from Sept. 27 to Oct. 24, over the corresponding period of last year.

Street Lighting in Birmingham.—The question of the restricted street lighting has again been considered by the City Council, who recently decided to support the present policy of the Watch Committee and the Chief Constable. Sir William Bowater, describing Birmingham "as the worst-lighted city," pleaded for a relaxation of the regulations, so as to permit of a little more illumination in busy side-streets running off the central thoroughfares. The lighting could be controlled quickly and efficiently. The Chairman of the Watch Committee (Mr. T. Brown) replied that, in the interests of the public, the present policy must be adhered to, though they would see if it were advisable to light a few more lamps at important crossings.

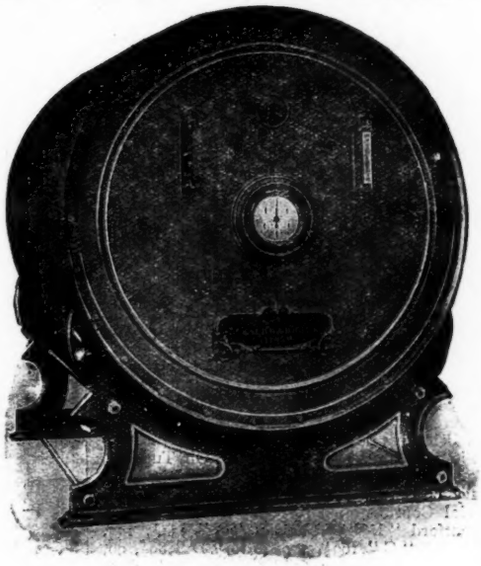
Tribunal Appeals at Dewsbury.—At the Dewsbury local tribunal recently, Mr. G. W. Fligg, the Corporation Gas Manager, appealed for Robert V. Farrar, aged 30, Class "A.," coal elevator man, and for Sam Gledhill, aged 24, Class "A.," hydraulic sealsman, both of whom were stated to be engaged seven days a week under present conditions, and occasionally for twenty-four hours a day. Mr. Fligg remarked that the work performed by Gledhill was dangerous, and said that a woman could not be put on to such work. Farrar was given conditional exemption; but Gledhill, by reason of his age and medical classification, was given only grace to March 1 next, when he has to join the Colours. The Military Representative agreed as to the importance of the man staying at his work during the winter.

BRADDOCK'S IMPROVED GAS METERS

No. 219. Braddock's Large Dry Meter.

LARGELY USED IN MUNITIONS WORKS.

Made in all Sizes.



No. 245. Braddock's Large Wet Meter.

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Coal Gas for Bus Service.—The use of coal gas as motor fuel, in a new bus service between Londonderry and Limavady, has been so successful that it has been found necessary to provide extra accommodation on a section of the journey. Supplies are taken from special stand-pipes at the respective gas-works at the end of each journey. The service is the first of its kind established in Ireland; and its working is being watched with great interest.

A Deficiency at South Shields.—At a meeting of the South Shields Corporation, a letter was read, from Mr. T. H. Duxbury (Engineer and General Manager of the South Shields Gas Company), expressing regret at the deficiency of the illuminating power disclosed by the Analyst's report of Aug. 8, and stating that the deficiency was quite unavoidable, and directly due to the treatment the gas is subjected to by order of the Ministry of Munitions in connection with the war.

Bolton Gas Reorganization.—The Bolton Corporation Gas Committee have decided on a scheme for the reorganization of the Gas Department. The chief decisions are that the Gas Engineer and Manager is to have the management and superintendence of the gas undertaking (including the gas-fittings department), with the exception of the collection of revenues. The Office Superintendent is to have the management and superintendence of the collection of all revenues of the undertaking (including the gas-fittings department).

Sligo Gas Supply.—A good deal of inconvenience arose in Sligo recently on the suspension of the gas supply, owing to the refusal of carters to take coal from the railway station to the Gas Company's yard, on the ground that the supply should have come by sea, and not by rail. It had been explained that the coal could not be brought by sea, because of the breakdown of the Company's steamer.

Price of Gas at Maryport.—The Maryport Council have increased the price of gas 8d. per 1000 c.ft.; thus bringing it up to 4s., the maximum figure they can charge. At the meeting on the 15th inst. Mr. R. W. Watson, the Chairman of the Gas Committee, who had given notice to increase the price from 3s. 4d. to 3s. 9d., was, in the changed circumstances caused by the additional 2s. 6d. per ton on coal, by the consent of the Council, allowed to move that it be 4s. after Dec. 25 next. Particulars as to the financial position of the gas-works were asked for; but these were, at Mr. Watson's request, taken in Committee—not, however, without a protest from Mr. J. Dixon, who held that it was public business, and ought to be given the widest publicity, in view of such a drastic proposal as to advance the price by 8d. Two amendments to increase the price respectively to 3s. 8d. and 3s. 9d. per 1000 c.ft. were lost—only receiving three votes out of 16; and the motion of the Chairman of the Gas Committee was adopted.

STOCK MARKET REPORT.

THE general characteristics of proceedings on the Stock Exchange last week were almost tantamount to a repetition of the features of the week before. Business was upon a more reduced scale, and the tone had faded somewhat into duller chords. The actuating factors, too, which led to this condition of affairs were much the same. There was the same formidable competition of the new War Bonds, which were drawing millions of money daily—a national triumph, though not to the advantage of Capel Court. With regard to war news, while the fine French success on the Aisne and a further advance (albeit somewhat weather-bound) on the Ypres front were very gratifying, the lingering paralysis of Russia and the Italian position on the Isonza were the reverse. But prices as a rule showed no great fall.

Home Government issues more than maintained their strength. The 5 p.ct. War Loan steadily hardened, and on Friday was done at 93⅞ *ex div.*, and Consols were firm. Home Rails were neglected and dull, but seemed to be steadying at the close. The American and Canadian Market was dull, and Argentines, after a fair opening, were depressed by the passing of a dividend. In the Foreign Market there were irregular movements. French, Scandinavian, and Brazilian did fairly well, and Russians contrived to check their continuous fall. The Miscellaneous Market maintained to a moderate extent its animation. Rubber did fairly well, though uneven at times, and oil advanced until checked by sales to realise profits. Less was heard about the Coalite adventures.

Business in the Gas Market was on a reduced scale of activity, and the aggregate of transactions recorded showed a falling off. But the intrinsic strength of the market was well illustrated by the fact that, even in so dull a week, all prices (with one exception) not only held firm but in most cases were fractionally better. Quotations underwent scarcely any change; but Gas Light ordinary had a further rise of one point, and Primitiva (the exception referred to) was ⅛ lower. In the Money Market, there was a steady demand, and rates were very firm. The fall in the price of silver, which had shrunk by daily stages from 55d. to 41⅞d. per oz. was arrested on Tuesday.

Bargains done for cash during the week were as follows: On Monday, Brentford "A" 80, Gas Light ordinary 69, 69⅛, 69⅜, 70, ditto preference 70½, Imperial Continental 89⅛, 89¾, 90, Primitiva debenture 78½, 78⅝, South Metropolitan debenture 56, 56½, 56⅝. On Tuesday, Bournemouth preference 9⅜, Gas Light ordinary 69¾, 70¼, ditto maximum 57½, 58, Imperial Continental 89⅛, 90⅛. On Wednesday, Brentford "B" 77, Barnet "A" 134¼, 135, Croydon "C" 169½, 170, ditto "D" 89½, 90, Gas Light ordinary 69⅛, 69⅜, 70, 70¼, ditto preference 70⅛, ditto debenture 55⅛, Imperial Continental 89¾, 90, Primitiva preference 61s. 3d., South Suburban 76. On Thursday, Gas Light ordinary 70⅛, Imperial Continental 90⅛, Monte Video 7⅞, Primitiva 37s. 6d., 38s. 9d., 40s., ditto preference 57s. 6d., South Metropolitan 73⅜, 74, 74⅛, 74⅜, 75, ditto preference 95⅝. On Friday, Commercial 3½ p.ct. 64½, Continental Union 39⅝, Gas Light ordinary 69⅛, ditto preference 70⅛, Imperial Continental 89⅛, 90, South Metropolitan 74, 75, ditto debenture 56⅛.

The Bank rate is 5 p.ct., as fixed on April 5.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue. £	Share.	When ex-Dividend.	Prev. Div. or Div. & Bonus. p.c.	Last Dividend.	NAME.	Closing Prices. July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
175,472	Stk.	Mar. 10	4	4%	Aldershot 4 p.c. Pref.	..	57—62	..
1,551,868	,,	April 8	2½	4⅜%	Alliance & Dublin Ord.	59—64	52—57	..
874,000	,,	July 10	4	4%	Do. 4 p.c. Deb.	76—79	57—62	..
280,000	5	April 29	7½	3/6	Bombay, Ltd.	5⅞—6⅜	4⅞—5⅜*	..
50,000	10	Feb. 26	16	14%	Bournemouth Gas and Water — 10 p.c.	29—30	23—25	..
383,110	10	,,	7	7%	Bournemouth Gas and Water — B 7 p.c.	15—15½	10¼—11	..
115,000	10	,,	6	6/-	Bournemouth Gas and Water — Pref. 6 p.c.	13½—14	9—9½	9½
159,740	—	—	—	4%	Bournemouth Gas and Water — 4 p.c. Deb.	..	69—71	..
992,045	Stk.	Feb. 26	14	5½%	Brentford A Consolid.	261—266	79—82	80
734,920	,,	,,	11	4⅛%	Do. B New	204—209	76—79	77
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	81—86	..
291,400	,,	June 11	4	4%	Do. 4 p.c. Deb.	91—93	65—67	..
217,380	,,	Feb. 26	11	10%	Brighton & Hove Orig.	208—213	145—150	..
244,200	,,	,,	8	7%	Do. A Ord. Stk.	154—157	98—103	..
530,000	20	Mar. 26	12½	22/6	British	44—45	32—33	..
120,000	Stk.	June 26	4	4%	Do. 4 p.c. Deb. Stk.	88—90	68—70	..
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	53—56	..
100,000	10	—	—	—	Cape Town & Dis., Ltd.	1½—2½	3—3½	..
100,000	10	—	—	4⅓%	Do. 4½ p.c. Pref.	4—6	6½—7½	..
100,000	Stk.	June 26	4½	4⅛%	Do. 4½ p.c. Deb. Stk.	70—75	60—65	..
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	78—79	..
1,513,280	,,	Feb. 12	5/9/4	4⅛/-	Commercial 4 p.c. Stk.	106—108	70—72	..
560 000	,,	,,	5¼	40/-	Do. 3½ p.c. do.	103—105	64—66	64½
475,000	,,	June 11	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	52—54	..
800,000	,,	,,	4	—	Continental Union Ltd.	76—79	39—41	39⅝
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	61—63	..
278,400	—	—	—	11¼%	Croydon B and C 7 p.c.	..	165—175	169½—170
—	—	—	—	10%	Do. E	..	..	..
492,270	Stk.	—	6	5½%	Derby Con. Stk.	123—125	95—100	..
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	80—83	..
1,002,180	10	July 29	10	5/0	European, Ltd.	17½—18	10½—11½	..
16,313,430	Stk.	Feb. 10	4/17/4	37/4	Gas 4 p.c. Ord.	98—102	69—71	69—70½
2,600,000	,,	,,	3½	3½%	Light and Coke 3½ p.c. max.	76—79	56—58	57½—58
4,062,235	,,	,,	4	4%	Light and Coke 4 p.c. Con. Pref.	96—99	70—72	70½
4,674 850	,,	June 11	3	3%	Light and Coke 3 p.c. Con. Deb.	72½—74½	55—57	55½
130,000	,,	,,	10	10%	Light and Coke 10 p.c. Bonds	..	..	..
258,740	,,	Mar. 12	5	3⅜%	Hastings & St. L. 3½ p.c.	87—89	48—53	..
70,000	10	April 29	11	6%	Hongkong & China, Ltd.	16½—16¾	7½—8¼	..
86,600	—	—	—	9%	Hornsey 7 p.c.	..	115—125	..
131,000	Stk.	Mar. 12	7⅛	7%	Ilford A and C.	151—154	92—97	..
65,780	,,	,,	6⅜	5¾%	Do. B	115—118	72—77	..
65,500	,,	June 26	4	4%	Do. 4 p.c. Deb.	92—94	65—68	..
4,910,000	,,	May 14	9	4⅘%	Imperial Continental	150—160	89—92	89½—90½
1,235,000	,,	Feb. 12	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	65—67	..
235,242	,,	Mar. 12	6½	6½%	Lea Bridge Ord. 5 p.c.	119—121	82—87	..
2,498,905	,,	Feb. 26	10	5%	Liverpool 5 p.c. Ord. A / B	211—213 / 146—148	82½—83	..
306,083	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	71—73	..
75,000	5	June 11	6	2/-	Malta & Mediterranean	4½—4⅝	3⅝—4	..
250,000	100	April 1	4½	4½%	Met. of Melbourne 4½ p.c. Deb.	99—101	88—98	..
541,920	20	May 28	4	6/-	Monte Video, Ltd.	11½—12	7⅜—8¼	7⅞
1,875,892	Stk.	July 29	4½	4½%	Newcastle&Gatsh'd Con.	98½—99½	71⅞—72¼	..
529,705	,,	June 26	3½	3½%	Do. 3½ p.c. Deb.	59—63	61—63	..
55,940	10	Feb. 26	7/14/0	7/-	North Middlesex 7 p.c.	14—15	9½—10⅜	..
300,000	Stk.	May 14	8	8%	Oriental, Ltd.	117—122	104—106	..
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½—7¾	2—3	..
60,000	50	Feb. 26	13	12%	Portsea, Island B	128—131	83—88	..
100,000	50	,,	12	11%	Do. C	118—121	73—78	..
52,000	50	,,	10	9%	Do. D	..	..	..
249,980	5	April 29	8	—	Primitiva Ord.	5⅜—6	1⅞—2⅛	37/6—40/-
499,960	5	June 26	5	2/6	Do. 5 p.c. Pref.	4⅜—5	2⅞—3⅛	57/6—61/3
521,600	100	June 2	4	4%	Do. 4 p.c. Deb.	91—93	78—80	78½—78⅞
—	—	—	—	4%	Do. ,, 1911	..	..	..
346,198	Stk.	June 26	4	4%	River Plate 4 p.c. Deb.	85—87	59—64	..
150,000	10	May 14	6	6/-	San Paulo 6 p.c. Pref.	10½—11	7½—8	..
125,000	50	July 1	5	5%	San Paulo 5 p.c. Deb.	47—49	40—42	..
135,000	Stk.	Mar. 12	10	10%	Sheffield A	223—224	..	..
209,984	,,	,,	10	10%	Do. B	223—224	180—184	..
523,500	,,	,,	10	10%	Do. C	220—222	..	..
90,000	10	May 28	9	6/-	South African	10½—11½	8½—9¼*	..
6,609,895	Stk.	Feb. 10	5/4/0	46/8	South Met. 4 p.c. Ord.	111—113	73—75	73½—75
—	—	—	—	—	Do. Pref.	—	—	95⅝
1,895,445	,,	July 10	3	3%	Do. 3 p.c. Deb.	72½—74½	55—57	56—56½
224,820	,,	Feb. 26	8½	7½%	South Shields Con. Stk.	157—159	137—139	..
952,795	,,	,,	6	4⅜%	S'th Suburb'n Ord. 5 p.c.	114—116	75—77	76
60,000	,,	,,	5	5%	Do. 5 p.c. Pref.	110—112	75—77	..
135,000	—	—	—	4⅜%	Do. West Kent	..	..	..
187,558	Stk.	June 26	5	5%	Do. 5 p.c. Deb. Stk.	116—118	86—88	..
647,740	,,	May 14	5	5%	Southampton Ord.	99—102	76—78	..
120,000	,,	Feb. 12	7½	5⅛%	Tottenham and District A 5 p.c.	135—138	92—97	..
782,275	,,	,,	6	4%	Tottenham and District B 3½ p.c.	115—117	66—71	..
181,255	,,	June 26	4	4%	Tottenham and District 4 p.c. Deb.	87—89	63—65	..
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	60—65	..
236,476	Stk.	Mar. 12	5	5%	Tynemouth 5 p.c. max.	108½—109½	89—91	..
30,000	,,	Feb. 26	8⅜	72/6	Wandsworth, Wimbledon, and Epsom—Wandsworth A 5 p.c.	151—156	112—117	..
255,636	,,	,,	6⅜	57/6	Do. B 3½ p.c.	129—134	97—99	..
108,075	,,	,,	5/17/3	50/9	Do. C 3½ p.c.	110—115	84—89	..
352,000	,,	,,	6⅜	51/3	Wimbledon 5 p.c.	117—122	85—90	..
98,000	,,	,,	6⅜	57/6	Epsom 5 p.c.	121—126	93—98	..
88,416	,,	June 26	3	3%	3 p.c. Deb. Stk.	66—69	50—53	..

* Ex Div.

Birmingham's Growing Gas Consumption.

Quite recently, Alderman Sir Hallewell Rogers, as Chairman of the Birmingham Corporation Gas Committee, issued through the columns of the local Press an urgent appeal for economy in the consumption of gas. At a meeting of the Committee last week reference was again made to the continued large increase in the output of gas. During the week ended Oct. 17, the output amounted to 265,325,000 c.ft., as compared with 220,212,000 c.ft. in the same period of last year—an increase equivalent to 20¼ p.ct.; and it was pointed out that the consumption for the last five or six weeks had been approximately 20 p.ct. higher than it was a year ago. This is causing the Committee great anxiety, in view of the shortage of coal and oil; and they once more expressed the hope that consumers would help them by economizing to the utmost possible extent. Later, on the motion of Alderman Lloyd, seconded by Mr. Stevens, a vote of thanks was accorded Sir Hallewell Rogers for his services as Chairman during the past year. The resolution expressed satisfaction that he had been able, notwithstanding his many activities, to devote so much time to the business of the department throughout a particularly anxious and strenuous year, and the hope that he would continue to give to the undertaking the benefit of his advice and assistance for many years to come.

Gas Tragedies.—Last Thursday a shocking discovery was made at the Star Inn, Penydre, near Neath. A servant, failing to obtain admission, called the police; and when an entry was forced the landlord and his wife, Mr. and Mrs. York, were found lying dead on a rug in the kitchen, and their three-months-old baby was dead on a sofa. The gas was turned full on, and in addition a hole had been bored in the house piping. At Hull last week, a verdict of "Accidental suffocation arising from coal gas poisoning" was returned at an inquest on Sydney Cuthbertson, a minesweeper. Evidence was given that on Tuesday deceased and a young woman were found gassed in a bedroom. The woman, who had recovered, stated there was no quarrel between them and no compact to commit suicide. The gas was burning low when Cuthbertson went to bed, and she could not account for the escape of gas. It was stated that the house had to be forcibly entered and that the room was full of escaping gas when deceased and the woman were found.

Inspection of the Monifieth Gas-Works.—In order to render them sufficient to cope with the increasing demands for gas, extensive improvements have lately been carried out at the Monifieth Gas-Works; and their completion was made the occasion of an official visit of inspection by the members of the Town Council, on the invitation of ex-Bailie White, the Convener of the Gas Committee. The party were shown over the works by Mr. J. D. Luck (the Manager); and at the close of the inspection, Provost Maiden complimented him on the well-kept appearance of the place, notwithstanding the present shortage of labour.

Darlington Gas-Works Accounts.—The accounts and statistics of the Darlington Corporation Gas-Works, prepared by Mr. Frank P. Tarratt (the Gas Engineer and Manager) and Mr. G. Dobson Wright (the Acting Borough Accountant)—for the year ended March 31 last show that there was a net profit of £6120; the gross profit being £15,738, from which there had to be deducted interest (£2476), sinking fund (£6985), and allowances to men on service (£156). The quantity of gas made was 442,677,000 c.ft., or 12,369 c.ft. per ton of coal carbonized, as compared with the previous year, 428,007,000 c.ft. and 12,074 c.ft. The unaccounted-for gas was 6·07 p.ct., against 5·95 p.ct. The total number of consumers increased from 15,320 to 15,420.

Gas Complaints at Hammersmith.—The General Purposes Committee, dealing in a report to the Hammersmith Borough Council, with complaints as to the pressure, calorific power, and price of gas supplied by the Brentford Gas Company, say: "It appears to be patent that the decreased calorific value of the gas is almost wholly due to Government requirements; and that the increase in price is attributable mainly to the increased cost of coal, &c., and the high freight rates. Having regard, however, to the somewhat widespread complaints which we have received, we have instructed the Town Clerk to forward to the Board of Trade a copy of the correspondence upon the subject between the Council and the Gas Company, together with resolutions by the Hammersmith Labour Council and the Heston and Isleworth Council, with a suggestion that the Board should investigate the whole matter. In taking this step we do not desire it to be inferred that we do not appreciate the difficulties with which the Gas Company are beset having regard to the requirements of the Ministry of Munitions as to the manufacture of the gas.

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